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ABSTRACT

The reform of schools and the modernization of workplaces are inextricably linked. Finding common ground begins with a realization that educators have a tripartite mission to teach students to be good neighbors, involved citizens, and qualified workers. Unless the reform of schools and reform of workplaces proceed at the same pace, a mismatch is risked between the supply of educated employees and the demand for them. To meet new international standards of quality, schools must undergo as thorough a reform as workplaces. They must do the following: provide more variety, customization, and convenience; be timely; get innovations; and deliver social responsibility. The required changes are the same ones required for business: new technology, new organizational formats, a highly skilled and autonomous work force. new management techniques, and labor-management collaboration. Changing the system requires new curriculum, changes in teacher preparation, ensured access for schools to high technology, a focus on needs of noncollege-bound students, and integrating academic and applied learning. (An appendix provides 152 reference notes. An executive summary highlights education's tripartite mission, convergence of business and education goals, using new technology, creating high-performance work systems, maintaining economic returns to education, measuring up to new skill standards, increasing value of education, integrating academic and experiential learning, and improving collaboration between schools and employers. Twenty reference notes are included.) (YLB)

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QUALITY EDUCATION:

School Reform for the New American Economy

EXECUTIVE SUMMARY

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Quality Education: School Reform for the New American Economy

Executive Summary

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Ten years ago the publication of A Nation at Risk[1] launched a wave of school reform and a continuing many-sided debate on the future of American education. Within that debate some of the most intense discussions have been among employers, educators and education unions. The dialogue often has been a productive one, but in some cases it has degenerated into a counterproductive exercise in assigning blame.

This report is not about assigning blame. It argues that neither the employers, the schools, nor the education unions are villains. In fact, all are in the same boat. They face similar challenges from the emerging economic reality, requiring similar types of responses. Most important, the successful reform of each depends on the successful reform of the others. The interdependence of workplace and school reform requires an effective dialogue among educators, employers and education unions. Dialogue between large and powerful institutions with different missions and cultures is always difficult. In the analysis that follows, we intend to reconcile the divergent views in the interest of finding common ground from which a balanced agenda for the simultaneous modernization of the workforce and the reform of schooling can proceed.

Education's Tripartite Mission

Finding common ground begins with the realization that in a community that is both diverse and individualistic, a political system that encourages participation, and a society where individuals support themselves through work, educators have a tripartite mission to teach students to be good neighbors, involved citizens, and qualified workers. In truth, the ability of educators to provide qualified workers has always been pivotal in meeting other missions. Ours is a society based on work. A job is the price of admission to this participatory polity and individualistic culture. Those unable to get and keep a job eventually drop out of the political system and disappear from community life. In the worst cases, the inability to get and keep a job extends over generations. Those locked out of the American economy create alternative cultures and economies of their own that threaten the mainstream American community.

The Convergence of Business and Education Goals

Happily, the educators' broad societal mission and the employers' more narrow economic interest are converging with human resource needs in the growing number of high-performance work systems, where workers are more autonomous, involved, and broadly skilled and where diverse workers and customers are valued.

The convergence between the tripartite mission of the schools and the needs of America's employers is strengthened further by new findings in the cognitive sciences. New findings on the way people learn suggest a reformed pedagogy that combines academic and experiential education in a system of lifelong learning in schools, in the community and at work. In addition, the growing interest in community service and the willingness of American employers to work with schools in order to get the employees they need provide an historic opportunity to end the isolation of American schools from both the community and the workplace. In combination, these convergent factors suggest a unique historical opportunity to create a seamless weave of academic and experiential learning that will make our schools, communities, and workplaces both more accessible and effective.

Balancing Access and Outcome Standards

At the heart of the emerging convergence of education and business goals is a profound restructuring of American institutions that began in private manufacturing in the early 1970s and has since extended its reach into private and public services, including education.

- In the old economy, institutions were judged on their ability to be productive and efficient: to produce high volumes of standardized goods and services at low prices, thereby giving greater access for an ever increasing share of Americans to everything from toasters to education.

- In the new economy, access standards have been joined by a more complex set of institutional performance goals in both education and business organizations including:

  - **Quality** - Meeting the highest professional, client, and global standards;

  - **Variety** - Moving beyond one-size-fits-all by providing diverse goods and services that meet the wants and needs of individual client groups;

  - **Customization** - Tailoring goods and services to individual wants and needs;

  - **Convenience** - Designing user-friendly goods and services and delivery methods;

  - **Consistency** - Meeting standards in virtually every case while moving toward zero-defect ;

  - **Speed** - Minimizing client time commitments in the consumption of goods and services;

  - **Continuous innovation** - Getting new ideas off the drawing board and into the hands of clients faster and winning the race up the learning curve by making continuous improvements in goods and services, and

  - **Social responsibility** - Producing and delivering goods and services in a socially responsible way.

These same standards apply in business and in schools. Students, parents, taxpayers, and employers experience pressures to meet quality standards in their own work organizations. They are also accustomed to demanding and getting quality as consumers of private goods. As a result, they want to see the same quality standards met in the schools.

- Quality education means meeting world-class education standards.

- Variety in education means schooling provided to meet the tastes of a student body

from diverse cultures, age groups, regions and special populations including the educationally disadvantaged, the gifted and learning challenged.

- Curricula need to be customized and delivered in formats tailored to learning styles of individual students.
- The educators' various clients expect education that is delivered conveniently with state-of-the-art user-friendly learning methods and technology.
- Educators are also challenged to deliver education quickly by certifying learning based on competencies rather than seat time.
- Educators need to strive for consistency by assuring that all students meet standards.
- Continuous improvement in education is the process of embedding learning systems into the education process to capture incremental improvements learned on the job.
- Innovation in education requires a constant inventory and dissemination of best practices as well as the ability to translate new ideas into workaday applications.
- Social responsibility standards require that educators are responsive to the needs of the community in all its diversity.

Using New Technology

New flexible technology, especially our old friend, the computer, in its various disguises, is pivotal in meeting new performance standards at the least cost.

- Flexible information-based technologies gives us the power to meet and monitor new quality standards.
- We can create variety with a few keystrokes on computer-based technology.
- We customize services with flexible information-based software.
- User-friendly technology encourages convenience in both the design and delivery of products and services.
- Speedy organizations are integrated with flexible information and communications technology.
- Information technology monitors outcomes and encourages consistency.
- New technology frees up people from rote physical and intellectual tasks, leaving employees free to interact with coworkers and customers in the interest of continuous improvements.

Technology can be a powerful tool to help schools meet the new standards of quality. Technology has two major roles in the schools:

(1) First, schools can acquaint young people with the technology they will confront when they enter the new economy. To be sure, technology is changing so fast that students will probably never use at work exactly the same piece of equipment they used in school. But schools can give students a general familiarity and comfort level with technology that is vital to their success in the modern workplace.

(2) Second, technology can be used in the art of teaching to provide variety, customization, and convenience. While ultimately the quality of learning depends on the quality of the interaction between a teacher and a student, technology can aid that interaction. It can also allow people to learn at their own pace and speed and can free the teacher from the repetitive lessons that are sometimes necessary for more important tasks.

Advanced technology has begun to enter the schools. But it is still not used widely enough or creatively enough to enable schools to meet quality standards. For example, the number of computers in schools in the last decade has grown tremendously.

- In 1991-92, a record 98 percent of schools reported having at least one microcomputer.[2] In 1989, high schools typically had between 40 and 50 computers, and the median elementary school had nearly 20.[3] Those numbers are surely higher today.

However, these numbers do not tell the whole story. Older types of computers still dominate in schools.

- Apple II and other eight-bit computers made up nearly 90 percent of elementary school computers in 1989, and roughly three-fifths of high school computers.[4]

- In addition, despite the increasing availability of a wider variety of software, most schools use software in fairly traditional ways.

- The largest proportion of instructional software in use today is focused on recall of facts and logarithms, instead of providing a learning environment for motivating higher-order thinking, problem solving and deep understanding, as the new economy will demand.

Overall, despite their increasing numbers, computers and other learning technologies are generally available but are seldom used or not used effectively in schools. Moreover, teacher education programs are not providing student teachers enough training in the use of technology.

- While 90 percent of teacher education programs now have computer laboratories, new technologies are seldom incorporated into methods courses for student teachers.[5]

- Only 13 percent of students report that computers were used "very often" or "often" in the instructional methodology they received during their student teaching.

- Fewer than one-third of prospective elementary teachers feel ready to teach with computers.[6]

Although the schools need more technology to reform education and meet the needs of the new economy, just "throwing computers at the problem" will not be enough to make a real difference. Technology also must be linked to organizational change with schools providing an environment that encourages innovative uses of the computer and other advanced technology.

- It takes fully five to six years of teaching with computers for teachers to master computer-based practices and approaches.

- Although barriers to the integration of computers have lessened for most of these teachers over the years, significant barriers still remain. The most serious problems for these teachers are inadequate amounts of hardware and time to plan and carry out computer-based lessons."

Creating High-Performance Work Systems

The inherent flexibility of new technologies requires high-performance organizational structures and processes that are equally flexible.

- High-performance work systems combine flexible technologies and work processes with more highly skilled and autonomous employees.

- Technology that is flexible and widely distributed requires organizations that give employees up and down the line the autonomy and skill necessary to exploit technical potential.

In order to meet new quality standards and exploit new technologies, successful organizations are abandoning large, centralized hierarchical structures. New performance standards and the technologies that accompany them encourage high performance work structures that are more flexible and decentralized.

- Available data suggest that high-performance systems account for a consistent 60 percent of performance improvements.

- Available data also suggest that as few as 5 percent and as many as 26 percent of private workplaces are attempting to install high-performance work formats. The vast majority of these are in manufacturing or in private service organizations, with relatively few in schools.

- High-performance workplaces are integrated by shared information, common goals, and outcome standards rather than by rules and top-down authority.

- High-performance work systems require labor/management collaboration.

- The relationship between unions and management is more important in education than in most American industries because high proportions of school employees belong to unions.

- In 1991, 16.1 percent of American workers belonged to unions,[7] but 85 percent of teachers worked under collective bargaining agreements negotiated through unions.[8] No significant change in schools will be possible unless the unions are involved. Unfortunately, unlike collective bargaining in private industry, most unions and school districts still negotiate over a relatively narrow package of items.

Maintaining the Economic Returns to Education

Education has always been good for employers. The contribution of education to economic growth has been consistent and flattering.

- Between 1948 and 1973, almost a fifth of the nation's growth in GNP was due to increased access to education for a growing share of Americans.

- Education consistently outperformed machine capital in its contribution to GNP growth throughout the period.

- In the period between 1973 and 1981, when productivity growth mysteriously stalled and declined, increased access to education avoided an even more precipitous fall, increasing its impact from 25 percent to more than 30 percent of the positive factors pushing productivity upward.

- Since the 1980s, increasing access to education continues to equal or outshine plant and equipment investment as the preeminent measured factor driving the nation's economic performance.

Education is good for American employers in four other respects:

(1) Education bears the principle responsibility for codifying, husbanding and disseminating knowledge that ultimately results in the creation of the next machine or the next product. Machines, after all, are human artifacts.

(2) Increased years of schooling correlate positively with a stronger work ethic.

(3) Educators are major providers of job-related skills. According to the Bureau of Labor Statistics, one-third of all workers who needed preparation for their jobs got some or all of that preparation from schools, and 13 percent who needed skill improvement after they were on the job said they got some or all of that retraining from schools.[9]

(4) Because of the proven relationship between educational attainment, work ethic and skill, employers always have utilized educational attainment as a sorting device to help them choose among job seekers.

Education has been good for enhancing economic opportunity for students as well.

- The best educated among us tend to get the best jobs and earn the most money,[7] especially those who are most educated in technical and business curricula.[8]

- In recent times, education has leveraged higher earnings, except in the later 1970s when a variety of factors, including a glut of well-educated baby boomers, slowed earnings returns to education.

- But the relationship between education and earnings accelerated again in the 1980s, more than doubling the economic returns to college relative to high school degrees. The real hourly wages of young males with 12 or fewer years of school dropped by about 20 percent from 1979 to 1989.[9] But real wages rose 20 percent during the 1980s for males who graduated from college.[10] Overall, one analyst concluded, "The wage premium for college was more than 100 percent larger for men and more than 50 percent higher for women in 1988 than in 1980."[11]

The continuing contributions of education to the economic partnership with American employers also depends on the educators' ability both to continue to produce traditional quantity increases in access to education and to meet new quality standards. The historical economic contribution of American education has resulted principally from increased access to schooling, especially in elementary and secondary education. Currently more than 86 percent of Americans complete high school by age 34. America's high school graduation rate places third among the major industrial nations compared with a high school completion rate of 90.6 percent and 91.5 percent in Japan and Germany, respectively.[12] Yet, even these statistics understate our successes because many of our adults who did not complete high school are not dropouts but adult immigrants who never went to school at all. Although we can still do better, as a greater proportion of people eventually graduate from high school, sheer quantity increases in high school graduation will bring diminishing returns. Moreover, marginal increases in high school graduation become increasingly difficult and expensive as an increasing share of those who do not have high school degrees come from populations that are hard to reach or hard to educate.

As quantity increases in K-12 education become more difficult, an increasing share of the economic contributions from K-12 systems will have to come from quality improvements. The greatest potential for quality improvements resides in improving educational offerings for the non-college-bound youth. These students who ultimately make the products, deliver the services, and interact with customers face the greatest skill gaps when they arrive in high-performance workplaces that provide nonsupervisory workers with the autonomy and flexible technologies necessary to meet quality standards.

There is still plenty of room to generate economic returns by increasing quantity in pre-school, post-secondary, and adult education and training. Only 36 percent of preschool children receive any formal educational preparation.[13] Ultimately the ability to perform in high-performance work systems begins with a strong preschool foundation, especially for disadvantaged youths who need a head start in preschool programs in order to catch up with more advantaged children.

There is also plenty of room for quantity increases in access to education after high school. In Switzerland, Germany and the Scandinavian nations more than two-thirds of all young people who do not go to college have access to apprenticeship systems. In the U.S., 24 percent of people between the ages of 18 and 34 start but do not complete college, and only 7 percent get vocational or associate's degrees.[14]

There appears to be substantial room for expanding education and training once Americans are on the job. In 1991, only 41 percent of American reported ever having been given either formal or informal education or training on the job. Only 16 percent of Americans have ever been retrained by their employer and only 13 percent of American workers got retraining from a school after they were on the job. European and Japanese employers train three times as many workers as American employers.

Measuring Up To New Skill Standards

Educators face a dual challenge for reform in response to the demands of the new performance standards and the new technologies and organizational formats necessary to meet them. They are challenged to put their own houses in order. Educators, like every other employer organization, need to meet new performance requirements by making better use of new flexible technologies and high performance organizational formats. At the same time, educators need to provide the more highly-skilled workers necessary to meet new performance standards, exploit new technologies and work in high-performance formats throughout the rest of the organizations in the American economy.

The schools have not failed in their economic mission. The mission has changed. American schools are doing about as well as they even have while increasing access to education from pre-school to graduate school. The steady performance of American schools is all the more laudable because increased access to schooling has come at the low end of the income scale among the educationally disadvantaged. But as American businesses have already learned, the old standards are no longer good enough:

- Economic competition has gone global and American schools have to measure up to the standards of our rivals. Even with all the caveats observed, American schools do not compare well with many of their international counterparts.

- The Japanese graduate 92.4 percent of their students on time (at age 18), compared to 88 percent in the U.S.,[15] and the average performance of Japanese eighth graders in technical subjects, such as mathematics, outstrips that of American eighth graders.[16]

- In general, the Japanese provide a higher standard of basic academic education for

all students. The Europeans provide more and better education and occupational training for non-college-bound youth and attribute much of their economic success to that fact. In Germany, about 85 percent of non-college-bound youth get an additional three to four years of apprenticeship training beyond high school.[17]

- A 1992 study of the Education Testing Service found that the school performance of the bottom level of students in the United States ranked next to last among fifteen nations studied and was second only to Jordan in disparity between high and low achievers.

- Standards should not only be higher, they need to be more widely applied. American students tend to know academic subject matter but their inability to apply academic knowledge suggests they do not understand what they know. Available evidence validates the view that while graduates may perform well on standard academic tests, they can not apply the same knowledge effectively in real-world situations.[18]

- New findings in the cognitive sciences suggest that traditional academic pedagogy ignores the value of experiential learning in real-world contexts and encourages passivity in students, ultimately hampering the transfer of academic knowledge into real-world applications.[19]

- School-based abilities are not necessarily the same as work-based abilities. Employers want employees with solid academic basics, but they want the applied versions of the three R's. Applied reading, writing, and math are substantially different from the versions taught in schools. In addition, employers want a set of behavioral skills that are not taught at all in traditional academic curricula, such as problem solving, communication skills, interpersonal skills and leadership.[20]

- Standards for all students need to be comparable. In the absence of comparable skill standards, an "A" in one school can be a "B" or "C" in another. A 1993 study by Abt Associates found that an "A" student in a poverty school would be a "C" student in a low poverty school when each student's performance was measured against standardized test scores.

The Increasing Value of Education

Economic changes have greatly increased the value of education. New competitive requirements tend to encourage the utilization of more highly educated employees working in conjunction with more powerful and flexible technologies and work formats. As a result, front line employees with high school plus a few years of postsecondary education tend to substitute for a much larger number of less educated front line workers with high school or less. Moreover, front line workers are supported by an increasing number of highly educated sales, managerial, professional, and technical workers in more elongated "value added chains" necessary in order to provide quality, variety customization, convenience, speed, innovation, and social responsibility in the final value of products and services. Even in manufacturing, which is projected to decline by 518,000 employees by the year 2005, employment of professionals will likely increase by 230,000 jobs.

In the new economic environment, production workers are more highly educated and work with a larger and more educated team to meet new competitive requirements.

- Front line workers use more autonomy and skill in combination with flexible technology and work processes to produce more per worker. In 1930 the value of output per production worker in manufacturing was $22,000 compared to an output per shop floor worker of $60,000 in 1993. Over the same period, the number of shop floor operators as a percent of the labor force has dropped from 27 percent to 15 percent.

- In order to meet new competitive standards, more highly skilled and productive front line workers are teaming up with a growing number of more highly educated workers. In 1930 for every production employee there were 12 non-production workers in various industries necessary to make the final sale; 4 more blue collar workers in transport; and 8 more highly educated workers in clerical, managerial, professional, and technical functions. Today, for every production worker it takes 21 nonproduction workers to meet new competitive standards. None of the 9 new workers are blue collar and all come from more highly educated sales, managerial, professional, and technical occupations.

The need to meet new standards by installing flexible technologies and high-performance work systems has accelerated basic changes in the structure of occupations favoring jobs that require education beyond high school.

- Between 1962 and 1992 farmers and production workers as a proportion of the total work force declined by 4 percent and 10 percent respectively. Only 5 percent of the decline in industry and farm jobs was due to increased imports. The vast majority of job losses was due to productivity increases through the installation of new technology and modern work practices.

- Over the same period, service workers increased by less than 1 percent.

- Virtually all of the increase in jobs since 1962 occurred among occupations that require college-level literacy and math skills. Sales, clerical, and administrative support workers increased by 6.38 percent. Managers, professionals, and technical workers increased by 7.4 percent.

- The shift to more highly educated workers was universal among American industries. For instance, today there are more managers, professional, and technical workers in service industries than there are production workers in manufacturing.

- Over the past decade, the scarcity of skilled workers has pushed up wages of those with postsecondary degrees and an oversupply of less skilled labor has driven down the wages of those with high school diplomas or less. College/high school wage differences doubled during the 1980s.

- Unemployment rates for college grads are at 3.2 percent compared with 6.8 percent for high school graduates and 11.4 percent for high school dropouts.

- Between 1992 and the year 2000, 89 percent of the jobs we will create will require postsecondary levels of literacy and math skills while only half the new entrants to the labor force are likely to possess postsecondary literacy and math skill levels. As a result, we should expect to see a continuation of the pattern of a surplus of low-skilled workers and a scarcity among high-skilled workers and an accelerating divergence between the wages of skilled and unskilled workers.

- Between 1992 and 2000, we will likely create 13.2 million new jobs, while losing about 1.3 million farm jobs and another half million production jobs to modernization and increased productivity.

- Of the 13.2 million new jobs, only 1.5 million, about 11 percent of new jobs created before the end of the century will come in relatively unskilled service delivery occupations.

- The remaining 89 percent of the jobs, about 10.7 million, will come in occupations that require postsecondary levels of math and literacy. Among these 5.4 million jobs, about 41 percent of all new jobs, will be created in sales, clerical, and administrative support occupations.

- The largest share of new jobs will come in managerial, professional, and technical occupations. We will create about 6.3 million such jobs over the period, about 47 percent of all new jobs. Interestingly, more than 80 percent of these new managerial, professional, and technical jobs will be created in service industries.

- Education barriers have dramatically reduced the ability of "trickle down" from economic growth to improve prospects for less educated workers. Simply increasing demand for more workers does not reduce poverty because the new jobs created require higher skill levels than typically found among poor Americans. For instance, in the 1960s, rapid economic growth reduced poverty rates by 10 percent. In the deficit-financed boom of the 1980s, however, the rising tide of economic growth did not raise all boats. By 1989 poverty had risen by a full 1 percent over the 1979 level.

- In the 1950s and 1960s, a single production worker with a high school diploma could earn a "family wage" -- enough money to support a spouse and child, buy a car, and own a home. In the 1990s it takes two earners with high school plus two years of postsecondary education to achieve the "family wage."

Integrating Academic and Experiential Learning

Available evidence suggests that the lack of transferability of academic learning into real-world

environments can only be remedied by providing a different pedagogy that mixes academic and applied learning. The integration of academic and experiential learning serves a variety of purposes critical to educational reform, the modernization of work, and improvement in the quality of community life.

The combination of academic learning with applications provides a superior pedagogy for all learners:

- Applied learning ends the isolation of schools from communities and workplaces and the isolation of youth from adults.
- Applied learning leavens academic curriculums with the authenticity of experience.
- Applied learning allows for the development of lifelong learning systems that utilize schools, workplaces, and communities as learning environments.

Promoting More Effective Collaboration Between Schools and Employers

Stronger relationships between schools and employers will improve both the quality of learning and performance on the job. In order to improve the link between schooling and workplaces:

- Learning needs to be more closely tied to selection, appraisal and rewards, both within employing organizations and in their relationships with the schools.
- Hiring needs to be more closely linked to school performance in order to motivate students.
- Curricula and credentials in schools need to be more closely linked to employer requirements in order to encourage employers to rely on school performance as the primary standard for hiring.

Hiring based on school performance will encourage students to meet academic standards. This would be especially beneficial for non-college-bound youth, who have little incentive to study while in school because they are not going on to postsecondary education and because their academic performance has very little impact on initial hiring decisions and entry-level wages. Standards with more relevance to employer needs would also encourage opportunity for earlier hiring in jobs with career potential. Currently, employers tend to wait to hire non-college workers for jobs with real career prospects until they are in their late twenties because employers trust proven experience and maturity more than school graduation as indicators of likely performance. Stronger collaboration between schools and employers could eliminate the developmental disconnect between high school graduation and the first good job for non-college youth that only comes available a decade later, after counterproductive and unguided wandering through a series of low-skill, low-wage jobs.

Crafting Complementary Academic and Workbased Skill Standards

Effective collaboration between schools and employers begins with the development of academic and workplace skill standards that are complementary and continuous.

- Skills standards should integrate academic basics, occupational skills, and behavioral skills.
- Basic academic skill standards should be developed and certified for all American students.
- Occupational skill standards should be developed for clusters of related occupations to encourage a maximum of career choices.
- Behavioral skills such as problem solving, teamwork, and interpersonal skills which are increasingly critical to a growing share of American workers, need to be integrated into both academic and occupational curriculums and taught in an applied context.

Standards should not result in standardization of approaches, curriculums or performance goals.

- Rigid uniformity in standards handed down to stakeholders will discourage commitment and ingenuity.
- High involvement in setting standards will liberate the energies of educators, students, parents, employers, and other stakeholders and encourage commitment.
- Standards and the pressures that create them should allow for a variety of approaches nested within a coherent set of broad national, state, local, and individual performance goals.

Creating Continuous Career Paths

Ultimately the vision of a lifelong learning system that combines work and learning should be judged by standards that measure its ability to increase choices and opportunity for both work and learning for students as well as its ability to satisfy performance requirements on the job. The diversity among American students, workplaces, and communities requires a variety of alternative paths that mix work and learning integrated by an incremental and sequential system of competency based standards.

The challenge is to build an integrated system of career pathways with different points of access and exits controlled by posted skill standards. Individuals should not be allowed to enter or exit a particular path without certification of skills and applied competencies. Every exit from a learning path should be validated by accredited learning and lead to either work or continued progress along another learning path that ultimately makes a four-year college degree accessible.

Career paths should be accessible to everyone at various points of entry. Everyone should be given a second chance, or however many chances they require to meet standards at every juncture along the way. There should be no dead ends. We need a lifelong learning system in which school-to-work programs are not a cul-de-sac but a continuous set of alternative pathways to both work and learning that encourages rather than forecloses four-year degrees for those who want them.

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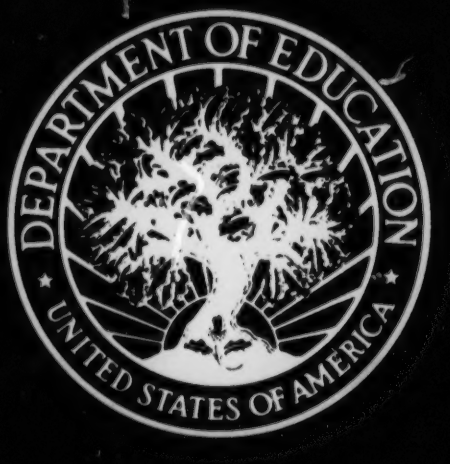

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QUALITY EDUCATION:

School Reform for the New American Economy

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Quality Education: School Reform for the New American Economy

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and
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Introduction

Ten years ago the publication of A Nation at Risk[1] launched a wave of school reform and a continuing many-sided debate on the future of American education. Within that debate some of the most intense discussions have been among employers, educators, and education unions. Although the dialogue has often been productive, in some cases it has degenerated into a counterproductive exercise in assigning blame.

This report is not about assigning blame. It argues that neither the employers nor the schools nor the education unions are villains. In fact, all are in the same boat. They face similar challenges from the emerging economic reality, requiring similar types of responses. Most important, the successful reform of each depends on the successful reform of the others.

The reform of schools and the modernization of workplaces are inextricably linked. The competitiveness of American employers increasingly depends on their ability to use and further develop knowledge originally learned in school. At the same time, the successful reform of American schools depends in large measure on expanding employer demand for more highly educated school graduates. If employers don't create high-skill jobs that use the skills supplied by a "reformed" and more effective school system, the economic incentives for school reform will be blunted. Yet school reform is not possible without more effective collaboration and greater trust between school managers and the education unions, who can provide a workers' voice central to effective reform.

The interdependence of workplace and school reform requires an effective dialogue among educators, employers, and education unions. Dialogue among large and powerful institutions with different missions and cultures is always difficult. In the analysis that follows, we intend to reconcile the divergent views in the interest of finding common ground from which a balanced agenda for the simultaneous modernization of the workforce and the reform of schooling can proceed.

In our view, the simultaneous reform of schooling and the modernization of American workplaces need to proceed in the context of the following set of principles:

- Finding Common Ground. In a community that is both diverse and individualistic, a political system that encourages participation, and a society in which individuals support themselves through work, educators have a tripartite mission to teach students to be good neighbors, involved citizens, and qualified workers. Happily, educators' broad societal mission and employers' more narrow economic interest are converging with human resource needs in the growing number of "high-performance work systems," where workers are more autonomous, involved, and broadly skilled and diverse workers and customers are valued.

  The convergence between the tripartite mission of the schools and the needs of America's employers is strengthened further by new findings about the way people learn, which

suggests a reformed pedagogy that combines academic and experiential education in a system of lifelong learning in schools, in the community, and at work. In addition, the growing interest in community service and the willingness of American employers to work with schools in order to get the employees they need provide a historic opportunity to combine academic and experiential learning in a way that will make our schools, communities, and workplaces both more accessible and effective.

- Balancing Supply and Demand. To balance the supply of educated workers with the demand for them in American workplaces, strategies for reforming schools need to be coordinated with macro- and micro-economic policies to increase the availability of high-skill jobs. To match graduates with available jobs, better information and collaboration between education and economic policymakers are essential.

  To ensure that learning in schools translates into performance at work, educators will need stronger relationships with employers and a new pedagogy that mixes academic and experiential learning. Employers will need to adopt human resource management policies that connect selection, appraisal, and reward systems at work to learning in school and on the job. To improve performance and increase demand for more highly educated workers, employers will also need to adopt high-performance work systems that combine flexible technologies and organizational formats with highly skilled workers.

- Integrating Academic and Experiential Learning. The integration of academic and experiential learning serves a variety of purposes critical to educational reform, the modernization of the workplace and the improvement in the quality of community life. The combination of academic learning with applications provides a superior pedagogy for all learners; ends the isolation of schools from communities and workplaces, and the isolation of youth from adults; leavens academic curricula with the authenticity of experience, and allows for the development of lifelong learning systems in schools, workplaces, and communities.

- Emphasizing Both Access and Outcome Standards. Historically, both educators and employers have provided access to standardized goods and services delivered at low prices. Access to education and to private goods and services continues to be a primary performance standard for educators and private employers, but in the new quality environment, outcome standards have become equally important measures of success.

- Meeting Quality Standards. Quality is at the core of the new emphasis on outcome standards. Quality standards can be divided into nine domains: variety, customization, convenience, speed, innovation, consistency, social responsibility, continuous improvement, and efficiencies based on a balance between investment and cost cutting. These same standards apply in business and in schools. Students, parents, taxpayers, and employers experience pressures to meet quality standards in their own work organizations. As consumers of private goods, they are also accustomed to demanding and getting quality. Hence, they want to see the same quality standards met in the schools.

Quality education means meeting world-class educational standards consistently and for all students. It means schooling provided in sufficient variety to meet the tastes of students from diverse cultures, age groups, and regions. Schools are also being asked to meet the educational needs of special populations including the learning disabled, the economically disadvantaged, and the gifted. In addition, educators' clientele want curricula delivered in formats tailored to learning styles of individual students. Finally, educators' various clients expect education that is delivered conveniently, quickly, and with state-of-the-art learning methods and technology.

- Adopting High-Performance Work Systems. Successful educational reform and workplace modernization depend on the development of high-performance work systems in both schools and workplaces. High-performance work systems have five elements: (1) appropriate technology, (2) flexible and team-based work processes, (3) formal and informal skill enhancement and professional development, (4) labor-management collaboration, and (5) total quality management (TQM) principles. The synergy among these elements operates best in work cultures that encourage the trusting relationships necessary to learning and flexible competitive changes.

- Investing in Access and Quality. Historically, the contributions of education to the nation's overall economic performance and to individual opportunity have derived principally from increasing access to grade school, high school, and now postsecondary education for a growing share of Americans. Future economic contributions from education will have to come from a mix of quality improvements and increased access. As high school graduation rates approach 90 percent of all adults, the greatest economic returns from K-12 education investments will come from overall quality improvements and improvements in graduation rates for the least advantaged people. Because access to postsecondary education is still relatively limited, the highest returns to postsecondary investments will come from improved access to education and training after high school, especially for non-college-bound youth and adults.

- Promoting More Effective Collaboration between Schools and Employers. Stronger relationships between schools and employers will improve both the quality of learning and performance on the job. To improve the link between schooling and workplaces, learning needs to be more closely tied to selection, appraisal, and rewards, within employing organizations and in their relationships with the schools. Most important, to motivate students to take schoolwork more seriously, the hiring of workers needs to be more closely linked to school performance. At the same time, to encourage employers to rely on school performance as the primary standard for hiring, curricula and credentials in schools need to be more closely linked to employer requirements.

  Hiring based on school performance will encourage students to meet academic standards. This would be especially beneficial for non-college-bound youth, who have little incentive to study while in school because they are not going on to postsecondary education and because their academic performance has very little influence on initial hiring decisions and entry-level wages. Standards with more relevance to employer needs would also encourage opportunity for earlier hiring in

jobs with career potential. Currently, employers tend to wait to hire non-college-bound workers for jobs with real career prospects until they are in their late 20s, because employers trust proven experience and maturity more than school graduation as indicators of likely performance. Stronger collaboration between schools and employers could eliminate the decade of counterproductive wandering through a series of low-skill, low-wage jobs on the part of non-college-bound youth.

- Crafting Complementary Academic and Work-Based Skill Standards. Effective collaboration between schools and employers begins with the development of academic and workplace skill standards that are complementary and continuous. Skill standards should integrate academic basics, occupational skills, and behavioral skills. Basic academic skill standards should be developed and certified for all American students. Occupational skill standards should be developed for clusters of related occupations to encourage a maximum of career choices. Behavioral skills, such as problem-solving, teamwork, and interpersonal skills, are increasingly critical to a growing share of American workers, and need to be integrated into both academic and occupational curricula and taught in an applied context.

  The development of standards should mean standardization of approaches, curricula, or performance goals. Rigid uniformity in standards handed down to stakeholders--students, parents, educators, communities, and employers--will discourage commitment and ingenuity. High involvement in setting standards will liberate the energies of stakeholders and encourage commitment. Standards and the pressures that create them should allow for a variety of approaches within a coherent set of broad national, state, local, and individual performance goals.

- Ending Academic Dualism. Some people fear that tracking in work-oriented programs for non-college-bound youth will foreclose the college option; yet the current system is clearly failing these youth. In order to respond to the legitimate concern for keeping the college option open and move beyond the current paralysis on policies for serving the needs of non-college-bound students, we need to have a continuous set of alternative paths to both work and learning that encourage rather than foreclose four-year degrees for those who want them.

- Creating Continuous Career Paths. Ultimately, the vision of a lifelong learning system should be judged by standards that measure its ability to increase students' choices and opportunity for both work and learning, as well as its ability to satisfy performance requirements on the job. The diversity among American students, workplaces, and communities requires a variety of paths that integrate work and learning through a sequence of competency-based standards.

  The challenge is to build an integrated system of career paths with different points of access and exits controlled by posted skill standards. Individuals should not be allowed to enter or exit a particular path without certification of skills and applied competencies. Every exit from a learning path should be validated by accredited

learning and lead to work or continued progress along another learning path that ultimately makes a four-year college degree accessible.

Career paths should be accessible to everyone at various points of entry. Everyone should be given a second chance, or however many chances the person requires to meet standards at every juncture along the way. There should be no dead ends. No path should foreclose the possibility of a four-year college degree. For instance, standards for both "second chance" systems and for high school graduates need to be set at levels that make students both employable and eligible for postsecondary schooling. Standards for postsecondary education outside the four-year college system should both enhance job prospects and qualify graduates for admission in a four-year institution. In addition, colleges and universities should provide credit in their admissions policies for the academic value of formal and informal learning at work.

- Building More Effective Transitions. The discontinuity between schooling and working in the United States no longer serves the learning and career needs of individuals at every age or the competitive needs of employers. Most students work while in school, and a significant share of employees continue schooling after they enter the job market, but relationships between work and school are spotty and relatively weak overall. Although many postsecondary institutions do have relationships with employers, those relationships tend to be strongest in applied disciplines and weak in the liberal arts or the more general curricula. People who do not go on to postsecondary institutions get little if any assistance in the transition from school to work. Adult workers have little access to intermediaries that provide counseling to help them combine schooling and work in the interest of career development.

  More effective transitions require a better articulation of continuous learning opportunities among high schools, two-year institutions, and four-year colleges and universities, as well as more assistance in combining work, schooling, and community service in all age groups. More effective transitions also require stronger formal and informal relationships among schools, communities, and employers, as well as better labor market information and more effective counseling.

- Enriching Education Reform with an Added Focus on Pedagogy. Educational reformers have concentrated on improving performance and standards in traditional academic subject matter. More reformers have ignored basic questions as to the best ways to teach content so that high school graduates can effectively use it in the community and on the job. The current focus in education reform on "what" should be learned needs to be enriched with an added focus on "how" subject matter should be taught. Experimentation with an enriched combination of traditional and experiential pedagogy seems indicated by advances in the cognitive sciences and should be integrated into reform goals.

- Getting from Here to There. Policy discussions on breaking the traditional barrier between academic and applied learning and extending more learning and work opportunities to non-college-bound youth usually end up focused either on Japanese models that connect academic achievement for all students to employment, or on west European "dual track" models that provide virtually universal access to college or apprenticeship for non-college-bound youth. Our ability to adopt the Japanese model will proceed apace with the growth of stronger relationships between schools and employers who are willing to hire on the basis of an applicant's school performance. The European systems for educating non-college-bound students are much more impressive than our own. Yet the sheer bureaucratic scale and costs of the European apprenticeship systems; the unique relationships among unions, government, educators, and employers that govern them; and their tendency to track students by social class suggest that we are unlikely to import European systems wholesale anytime soon.

  While the Japanese and west Europeans provide a useful benchmark, we Americans are more likely to produce our own reforms through evolutionary improvements in the variety of approaches emerging or already under way in our education system. Building a reform strategy around evolutionary and varied approaches is probably both prudent and realistic. "One size fits all" reforms discourage innovation by reducing the number of developmental paths. In addition, "one size fits all" approaches ignore the variety of needs and conditions in the American community. Moreover, standardized reforms tend to reduce ownership and involvement of students, parents, educators, communities, and employers.

  Educational reform based on incremental improvements in a variety of approaches need not be chaotic or slow so long as every approach strives toward a common framework of ultimate outcomes. We believe that there is broad agreement on the following four outcomes:

  1. Equity. Educational programs should provide alternative pathways available to a broad cross section of learners that lead to work opportunities without foreclosing further career development or schooling through four-year college education for those who want it.

  2. Involvement. Programs should be designed, delivered, and evaluated with the full participation of students, educational professionals, parents, community representatives, and employers.

  3. A More Experiential Pedagogy. Curricula should reflect a balance between the traditional academic learning formats and a more experiential pedagogy. A more experiential pedagogy delivered in schools should be balanced with learning experiences outside the classroom, including applications in the community and in the workplace.

4. Certifiable Standards. All learning should lead to certifiable performance standards that include applications and demonstrations in an applied context.

The development of a framework of principles and outcome standards can provide cohesion in a reform structure that is decentralized and varied. A framework of principles by itself, however, will not expedite progress or create scale in the reform movement. To accelerate progress and create scale, varied reform efforts need to be attached to strategic efforts to "make 'em," "bribe 'em," and "show 'em how" to move toward the vision implicit in the new reform framework. Make 'em strategies include new performance standards set at the federal, state, and community levels and attached to certification and funding. Bribe 'em strategies, the path of least resistance, include new program funding to assist in meeting standards or to promote new practices. Show 'em how strategies require the development of new collaborative relationships, including the development of networks of reform programs to encourage benchmarking of best practices and the development of supportive relationship among reformers; a systematic inventory, analysis, model development, and dissemination of model practices; and technical assistance.

Some mix of all three strategies is necessary to expedite and achieve scale in reform. Make 'em strategies work best if resources are provided and technical assistance is available. Bribe 'em strategies tend to result in ritual grantsmanship in the absence of performance standards and the know-how that comes with efforts to show 'em how. Show 'em how strategies, by themselves, do not provide the leverage that mandates and resources bring.

Education's Three Missions

To some extent the underlying tension in the dialogue between educators and employers reflects healthy differences in the missions and cultures of education and employer organizations. The most fruitful dialogues among educators, employers, unions, and political leaders begin with a common understanding of the enormous importance of public education institutions not only in our economy but also in the proper functioning of our political system and culture.

Education serves three masters: the political system, the culture, and the economy. In a political system that depends on consent and participation, and a culture that values individualism and cultural differences, it is the responsibility of public education to teach students how to be good neighbors and involved citizens who are tolerant, free-thinking, and autonomous and who must ultimately make difficult choices in balancing the interests of the community and the economy.

Education also has an economic mission that is inextricably bound to its cultural and political roles. In this era of accelerating economic and technical change, education has become crucial in preparing young people for work and for reeducating experienced employees who want to brush up or get ahead. In an economy where job security depends as much on dedication to skill development as on loyalty to a current employer, employees have learned the hard way to take responsibility for their own career development.

In recent years, as jobs have become harder to get and more difficult to keep, the nation has learned that the inability to get and keep a job harms both poor people and experienced workers dislocated by economic change. The poor start out, and end up, at the bottom of the economic heap for want of skills necessary to get and keep well-paid work.[2] Experienced workers who become dislocated workers rarely end up poor; they suffer not so much from where they land but from how far they have to fall. Those who have the least education fall the furthest.[3] Dislocated workers who have or obtain more education recover fastest.[4]

In truth, the ability of educators to perform their economic role has always been pivotal in meeting their political and cultural responsibilities. Ours is a society based on work; a job is the price of admission to this participatory polity and individualistic culture. People who are unable to get and keep a job eventually drop out of the political system and disappear from community life. In the worst cases, the inability to get and keep a job extends over the generations. People locked out of the American economy create alternative cultures and economies of their own that threaten the mainstream American community.

In less extreme cases, people who lack the requisite skills for jobs in the new economy will fall further and further behind those who have the skills, creating a dangerous schism in society between the haves and the have nots. This is already happening as the gap widens between the earning power of people with a high school education or less and those with education beyond high school.[5]

The Economic Partnership between Employers and Educators

Education has always been good for employers. The contribution of education to economic growth has been consistent. Between 1948 and 1973 almost a fifth of the nation's growth in gross national product (GNP) was due to increased access to education for a growing share of Americans. Education consistently contributed more to GNP growth than did machine capital. Between 1973 and 1981, when productivity growth mysteriously stalled and declined, increased access to education avoided an even more precipitous fall; education rose from 25 percent to more than 30 percent of the positive factors pushing productivity upward. Since 1980, increasing access to education continues to equal or outshine plant and equipment investment as the preeminent measured factor driving the nation's economic performance.

Education is good for American employers in at least four other respects:

1. Education bears the principal responsibility for codifying, husbanding, and disseminating knowledge that ultimately results in the creation of the next machine or the next product. Machines, after all, are human artifacts.

2. Increased years of schooling correlate positively with a stronger work ethic.

3. Educators are a major provider of job-related skills. According to the Bureau of Labor Statistics, one-third of all workers who needed preparation for their jobs got some or all of that preparation from schools, and 13 percent who needed skill improvement after they were on the job said they got some or all of that retraining from schools.[6]

4. Because of the proven relationship among educational attainment, work ethic, and skill, employers always have used educational attainment as a sorting device to help them choose among job seekers.

Education has been good for enhancing economic opportunity for students as well. The best educated among us, especially those who are most educated in technical and business curricula, tend to get the best jobs and earn the most money.[7] In recent times, education has leveraged higher earnings, except in the later 1970s when a variety of factors, including a glut of well-educated baby boomers, slowed the returns of earnings to education. But the relationship between education and earnings accelerated again in the 1980s. As one analyst has noted, "One of the most remarkable features of wage behavior in the 1980s is the sharp rise in the wage premium paid for workers with higher levels of schooling and thus in the economic return to additional schooling."[8] From 1979 to 1989, the real hourly wages of young males with 12 or fewer years of school dropped by about 20 percent,[9] while real wages rose 20 percent for males who graduated from college.[10] Overall, one analyst concluded, "The wage premium for

college was more than 100 percent larger for men and more than 50 percent higher for women in 1988 than in 1980."[11]

The relationship between education and the economy is a classic case of the chicken and the egg. In the long term, the quality of mind determines economic possibilities. In the short term, however, the quantity and quality of jobs are influenced only marginally by the quality of labor supplied. In the short term, the supply of educated labor does not create jobs so much as the jobs available create demand for education. In the short term, we can educate until we are blue in the face, but if the jobs that use educated workers are not there, the economic value of the education provided will decline and ultimately discourage investments in education that does not lead to employment.

To some degree the long term is just the sum of a series of short-term adjustments between education and employers. As a result, the short term can powerfully influence the long-term relationship between education and employers. If, for instance, in the short term, market forces encourage employers to make products and use work systems that rely on low-skilled workers, general economic prospects and individual opportunity will be negatively affected over the long haul, because low-skill economies do not encourage the accumulation of human and technical capital necessary for long-term growth. As a result, in the short term, employers need to be competitive in skill-intensive products and services to sustain and increase the demand for high-skill workers and the infrastructure that produces them.

The future prospect for the continuing partnership between education and employers depends on the ability of American employers to meet new quality standards in high-skill product and service markets. Skill-intensive products and services tend to encourage the most valuable kinds of applied learning in the economy and stronger learning partnerships between educators and employers. It matters whether we make potato chips, or computer chips, not so much because of the relative prices of the products, but because making computer chips is more learning-intensive and more in the interest of national competitiveness and individual opportunity over the long haul.[12]

The continuing contributions of education to the economic partnership with American employers also depend on educators' ability both to continue to produce traditional quantity increases in access to education and to meet new quality standards. The historical economic contribution of American education has resulted principally from increased access to schooling, especially at the elementary and secondary levels. Currently, more than 86 percent of Americans complete high school by age 34. Our high school graduation rate is third among the major industrial nations (Japan's rate is 90.6 percent and Germany's 91.5 percent).[13] Yet even these statistics understate our successes because many of our adults who did not complete high school are not dropouts but adult immigrants who never went to school at all. Although we can still do better, as a greater proportion of people eventually graduate from high school, sheer quantity increases in high school graduation will bring diminishing returns. Moreover, marginal increases in high school graduation become increasingly difficult and expensive as an increasing share of those who do not have high school diplomas come from populations that are hard to reach or hard to educate.

As quantity increases in K-12 education become more difficult, an increasing share of the economic contributions from K-12 systems will have to come from quality improvements. The greatest potential for quality improvements lies in improving educational offerings for the non-college-bound youth. As discussed later, these students who ultimately make the products, deliver the services, and interact with customers face the greatest skill gaps when they arrive in high-performance workplaces that provide nonsupervisory workers with the autonomy and flexible technologies necessary to meet quality standards.

There is still plenty of room to generate economic returns by increasing quantity in preschool, postsecondary, and adult education and training. Only 36 percent of preschool children receive any formal educational preparation.[14] There is also plenty of room for quality increases in access to education after high school. In Switzerland, Germany, and the Scandinavian nations more than two-thirds of all young people who do not go to college have access to apprenticeship systems. In the United States, 24 percent of people between the ages of 18 and 34 start but do not complete college, and only 7 percent get vocational or associate's degrees.[15]

At present more than 23 percent of Americans graduate from four-year colleges or universities, and our graduation rates still set the world standard. The Japanese are a close second, graduating 22.9 percent of their population by age 34. The United States graduates the highest proportion of its women at 23.5 percent, compared with Japan's 11.5 percent. Japan graduates a higher proportion of men at 34.2 percent, compared with 9 percent for the United States. In overall college graduation rates, Canada ranks third, graduating 16.1 percent, and Germany, fourth, graduating 11.8 percent, of their populations by age 34.[16]

There appears to be substantial room for expanding education and training once Americans are on the job. In 1991, only 41 percent of Americans reported ever having been given formal or informal education or training once they were on the job. Only 13 percent of American workers got their retraining from a school. A growing literature argues persuasively for expansion in access to both formal and informal learning for employed workers.

Compared to What?

Educators and employers have two very different views of school performance. The conventional wisdom among employers, political leaders, and the general public is that the schools have failed in their economic mission because they have not taught young people the skills necessary to succeed in a modern economy. Schools, therefore, need to be reformed in the interest of economic competitiveness and individual opportunity.

A contrary view comes from a diverse group of analysts and opinion leaders who assert that the schools should not be blamed for America's competitive troubles.[17] After all, they point out, the schools did not make the products and services that did not sell. American employers did. Moreover, they point out that because the new high school graduates replace existing workers at only 3 percent per year, the vast majority of workers who were in place in the competitive 1960s were the same workers in place in the noncompetitive 1970s and 1980s.

These defenders of American schools present an impressive array of statistics to demonstrate that, in fact, American schools are doing better than ever. Their data make the case for a school system that has maintained and, in some cases, improved performance while increasing access to education at every level from preschool to graduate school. They conclude that this maintenance or slight improvement in standards and increased access is all the more remarkable because greater access has come at the lower end of the income scale among the least educationally advantaged students who should have dragged performance downward.

The differences between reformers and defenders of American schools are more illusory than real. To reconcile their divergent views, it is necessary to ask not only how are the schools doing but also, compared to what?

Throughout the post World War II period, education, like the American workplace, improved its performance continuously, if only incrementally, while providing dramatic increases in access to schooling to the least educationally advantaged. We can no longer compare the performance of American schools with the performance of the workplace. Standards for organizational performance have gone global. Nor can we judge educational requirements by assessing the needs of the vast majority of American employers. In this era of fast-paced economic change, the more competitive high-skill, high-wage economy we need and want is reflected in the skills needs of relatively few employers at the cutting edge of economic change.

A closer comparison of both what is actually taught in schools--the curriculum--and how teaching occurs--the pedagogy--reveals a more profound disconnect between schooling and workplace requirements. Employers judge students on the basis of performance on the job, and schools judge students on the basis of academic achievement. Achievement tests suggest that students master the content in school curricula reasonably well, but performance on the job requires mastery of behavioral skills that make employees effective team members as well as mastery of traditional academic skills. In addition, the traditional academic pedagogy encourages passivity among students and discourages the development of hands-on learning skills critical to success in the workplace. Moreover, as is discussed later, the traditional academic pedagogy teaches academic knowledge but does not teach students how to apply effectively what they learn.

In Praise of American Schools

The schools have not failed to perform the economic mission for which they were created--giving us the workforce to run an economy that has been the world productivity leader since 1870. The evidence clearly shows that the schools are doing at least as good a job as they ever did, and, in some ways, they are doing better.

This may seem hard to believe 10 years after A Nation at Risk reported that our schools are "awash" in a "rising tide of mediocrity," adding, "If an unfriendly foreign power had attempted to impose on America the mediocre educational performance that exists today, we might well have viewed it as an act of war." That report was followed by a wave of similar analyses that seemed to leave no doubt that our schools were a failure.

But a close look at our schools reveals a more complex reality. Before looking at how the schools have performed, one must keep in mind that schools are serving a higher proportion of the population and a more culturally diverse student body at every grade level than they ever have. According to the latest statistics available from the U.S. Department of Education, between 1976 and 1988 the proportion of white students in public schools declined from 76 percent to 70 percent while the percentage of minorities grew from 24 percent to 29 percent. The percentage of Hispanics has increased by about half, to 10 percent, while the percentage of Asians has almost tripled to 3.1 percent.[18] In our central cities the challenges of diversity are even greater.[19] The percentage of students who are black or Hispanic in central city schools and has living below the poverty line decreased from 27 percent in 1960 to 15 percent in 1970, but has risen since, ranging between 18 and 22 percent. The percentage of children in poverty living with a female householder has increased from 23.7 percent in 1960 to 58.1 percent in 1990. About 1.9 million limited-English proficient children were in school in 1989-1990.[20] Almost a third of all students work.[21]

These figures become especially impressive when we compare them with similar data for our international economic competitors. The poverty rate for children in the United States was more than twice that of children in western Germany, for example. Only one-seventh of German children live in single-parent households, and of those only 35 percent in poverty. Fewer than 6 percent of Japanese children live in single-parent households. The divorce rate among women in the United States is almost three times that of German women and four times that of Japanese women.[22]

As a result of these trends, America's schools face a student population that is a greater challenge to teach than previous populations, which were more homogeneous and received more parental direction. America's schools also have a much greater challenge than many of their overseas competitors.

This makes even more remarkable the fact that during the time when it has been claimed American schools are in a steep decline, our students' performance on average has consistently improved or remained about the same. Says one analyst, "The evidence overwhelmingly shows that American schools have never achieved more than they currently achieve. Some indicators show them performing better than ever."[23]

Consider the following:

- High school graduation rates have improved dramatically. In 1910, approximately 10 percent of students graduated from high school. By 1965, that number had risen to 65 percent. Now more than 85 percent of 24- to 25-year-olds eventually get their high school diploma or GED. In 1973, 70.9 percent of African Americans ages 24 to 25 got their diplomas. In 1990 the number had risen dramatically to 82.2 percent.[24] The proportion of 19- and 20-year-old Hispanics with high school diplomas increased from 54.7 percent in 1974 to 59.7 percent in 1990 in spite of a major influx of immigrants without secondary school education.[25]

- More than 99 percent of American students take some math and science. Since 1982 the percentage of high school students who take algebra is up from 65 percent to 81 percent, while the percentage of students who take first-year biology is up from 75 percent to 95 percent.[26]

- The percentage of schools using computers for instructional purposes grew from 16 percent in 1981-82 to 98 percent a decade later. And the ratio of students to computers continues to decline. Only eight years ago it was 1 for every 125 students. In 1990-91 it was 1 for every 18.[27]

- Postsecondary enrollments continue to grow rapidly in absolute numbers and as a proportion of high school graduates, despite a decline in the numbers of high school students. The decline began in 1977 and will not stop until the mid-1990s. Enrollments in postsecondary institutions increased from 21 percent of high school graduates in 1975 to 46 percent of high school graduates in 1989.

- The proportion of high school graduates who have completed a postsecondary program has increased. Since 1971, associate degrees have increased by 72 percent; undergraduate degrees by 21 percent, master's degrees by 34 percent, and professional degrees by 87 percent. This could just mean there is a lot more schooling but less learning. Again, a close look reveals that the schools are doing the job society has asked them to do.

- The National Assessment of Educational Progress (NAEP) has assessed what students know and can do in reading, writing, science, mathematics, and other subjects for the past 20 years. NAEP figures reveal little change during that time. Average reading among 9- and 13-year-olds was about the same in 1990 as it was 20 years earlier; among 17-year-olds it was slightly higher in 1991. Average writing proficiency among 4th- and 11th- graders was about the same in 1990 as it was in 1984, among 8th- graders it was somewhat lower. Average mathematics proficiency among 9- and 13-year-olds was slightly higher in 1990 than in 1973; among 17-year-olds it was about the same. Average science proficiency among 9- and 13-year-olds was the same in 1990 as in 1970; among 17-year-olds it was lower.

- Although overall scores have not changed much in two decades, the gap in achievement between whites and minorities has narrowed substantially. Blacks have improved relative to whites in reading, mathematics, and science. Reading scores for 17-year-olds of all races have improved slightly from an average of 285 in 1971 to an overall average of 290 in 1990. The average score for African Americans has shown more substantial improvement, increasing from 238 to 267 over the same period. Scores for Hispanics have increased from 252 to 275. Throughout the period reading performance has placed American 17-year-olds at the high end of the "intermediate" range, meaning they can search for specific information, relate ideas, and make generalizations.[28]

- The historical tendency in math proficiency also has promising news about minorities. The overall scores for math stayed the same, barely moving from 304 to 305 between

1973 and 1990. But the scores for blacks were up from 270 to 289 during the same period, and scores for Hispanics were up from 277 to 284.[29]

- Participation in SAT exam, required for admission to most colleges, increased significantly. In 1991 percent of high school graduates took the SAT, up from 33 percent in 1980.

- Scores on the SAT test have declined, but only slightly. Overall scores have declined from a mean of 937 in 1972 to 900 in 1990.[30] Since 1976, however, verbal and math scores among African Americans have increased by 20 and 30 points respectively.[31] Moreover, some, or all, of the overall decline may be due to the fact that the proportion of high school graduates taking the test has increased and that the students tested come from a more culturally diverse population. It should also be noted that during the 1980s the proportion of senior class that scored at high levels, above 600, on the SAT in math rose by 35 percent, while those performing at high levels on the verbal section was up 20 to 25 percent.[32]

- Between 1981 and 1990, the California Achievement Test and the Comprehensive Test of Basic Skills showed math achievement rising in all grades and language performance increasing.[33]

- The Iowa Test of Basic Skills showed steady rises in achievement since the mid-to-late 1970s in grades 3 through 8, and the Stanford Achievement Test showed "very significant gains" between 1973 and 1982 and steady gains from 1982 to 1986.[34]

Meeting Global Standards

In short, it is not true that U.S.schools are in decline. They are meeting traditional academic standards as well as, or, in some respects, slightly better than they ever have. The problem is that past standards are no longer enough. Schools must do more than measure up to their past performance. As Al Shanker, president of the American Federation of Teachers (AFT), said recently in discussing the performance of schools, "If I buy a car, I don't give a damn if it's better than the 1970 model. I care whether it's better than the Japanese car across the street."[35]

America's schools must measure up to those of our economic rivals. International comparisons of education performance are difficult. They tend to be unfair to American schools because there is less access to education in many parts of the world, and most other school systems in the world are more elitist.[36] As a result, we often end up comparing our average students against their best students. Even when we compare our best to theirs, our best tends to be a much larger and more inclusive group.

Even with all the caveats observed, American schools do not compare well with many of their foreign counterparts. The Japanese graduate 92.4 percent of their students on time (at age 18), compared with 88 percent in the United States,[37] and the average performance of Japanese 8th-graders in technical subjects, such as mathematics, outstrips that of American 8th-graders.[38] In general, Europeans provide more and better education and occupational training for non-college-

bound youth and attribute much of their economic success to that fact. In Germany, about 85 percent of non-college-bound youth get an additional three to four years of apprenticeship training beyond high school.[39] The Japanese provide a higher standard of basic academic education for all students.

Knowing versus Understanding

The disconnect between employers' and educators' assessment of school performance also stems from different perspectives on skill requirements. School-based abilities are not necessarily the same as work-based abilities. Educators' sense of skill derives from assessments of proficiency in academic subject matter. Employers base their assessments of skill on the ability of graduates to apply knowledge. Available evidence supports both views. As just summarized, evidence from test scores and other standardized measures of academic knowledge suggests that American schools are holding their own while expanding access to education, at least as compared with past performance in American schools. Other evidence validates the employers' view, however, that although graduates may perform well on standard academic tests, they cannot apply the same knowledge effectively to real-world situations.[40]

Schools and workplaces assess skills differently because schools emphasize knowledge, whereas workplaces require the effective transfer and use of academic skills. American graduates may know enough to pass the test, but their inability to apply what they learn in school in real-world contexts suggests that they do not really understand what they know. The new findings in the cognitive sciences suggest that traditional academic pedagogy ignores the value of experiential learning in real-world contexts and encourages passivity in students, ultimately hampering the transfer of academic knowledge into real-world applications.[41]

The Skills Mismatch

Different conclusions by educators and employers about the performance of American schools may also stem from the fact that school-based competencies are not always the same as workplace skill requirements. Employers want employees with solid academic basics, but they want the applied versions of the three R's. Applied reading, writing, and math are substantially different from the versions taught in schools. In addition, employers want a set of behavioral skills that are not taught at all in traditional academic curricula, such as problem-solving, communication, interpersonal, and leadership skills.[42] It is noteworthy that the new evidence and thinking in the cognitive sciences suggest that these skills can be incorporated in a more experiential pedagogy, even in such traditional academic subjects as history and English.

Schools and Factories

Both schools and factories will have to change to meet new, international standards of quality if they are to survive and to thrive. For almost a century the structure of U.S. schools has been closely tied to the structure of U.S. business. As a result, both succeeded in the same way--through producing the most products for the lowest cost. Both began to suffer when productivity was no longer enough.

In the 19th century, the primary purpose of the American public school system was to provide a relatively small number of students with intellectual mastery of core academic subjects.[43] Few primary students went on to secondary school, and those who did usually went to private institutions. The number of public high schools grew, but very slowly. They were modeled on private schools, following a classical curriculum with admission by competitive examination. Craft skills reproduced themselves in hand-me-down work-based learning systems outside the formal education system.

At the end of the 19th century, America shifted from an economy based on craft production to one based on the factory system of mass production. The factory system began in manufacturing, yet ultimately its principles dominated extractive industries and services as well. In that system, goods and services were standardized and reduced to their smallest and most reproducible parts. Rigid, single-purpose machines were then designed to make each component, and relatively unskilled workers were hired to tend the machines. A minimum of technically skilled workers were required to make and maintain machines. Elite managerial and technical workers were then installed at the top of authority-based pyramids to orchestrate components into final products using rigid, top-down control systems.

The result of this shift to mass production was that for most of this century the United States enjoyed astonishing productivity and breathtaking economic performance. In the late 19th century, as America moved from an economy based on craft methods to one based on the factory, educational reformers began to demand that the schools change. They wanted schools to imitate the new economic structures that were sweeping before them and creating great wealth. Schools were to be organized like factories and schooling was to conform to the mechanical machine rhythms and cadences of the new industrial age. William T. Harris, one of the leading educators at the turn of the century, stated,

> In modern industrial society, "conformity to the time of the train, to the starting of work in manufactory," and to other characteristic activities of the city require absolute precision and regularity. . . .The student must have his lessons ready at the appointed time, must rise at the tap of the bell, move to the line, return; in short go through all the evolutions with equal precision.[44]

Imitating the success of the business community meant that schools, like factories, would be organized in a strictly hierarchical fashion. Each school would be run from the top by a boss, the principal. To make teachers' tasks as simple and repetitive as possible, each teacher would

have an assigned room with students of the same age. Students would also be separated by ability. To ensure that each teacher, like each industrial worker, performed efficiently, detailed instructions were given about what work would be done, what standards should be met, what books and other teaching aids would be used, and so on. Students would be given grades and passed up the line to the next teacher. Knowledge also was organized into the factory model. Knowledge was separated from its natural interdisciplinary uses in real-world applications and broken into separate disciplines. Each discipline was codified into a hierarchy of carefully graded steps from introductory to mastery levels.

The factory model of school worked. Overall, it processed large numbers of students at relatively low costs. It produced a fairly small, white collar elite who possessed most of the skills needed for the limited number of managerial, professional and elite technical jobs. And it turned out a much larger, less-skilled, blue-collar workforce, those who made the products and delivered the services to customers. It helped this country absorb millions of immigrants and enabled them to take part in the tremendous economic growth that began early in the 20th century.

By the latter half of the 19th century, America had become the world's mass-production leader, as a result of our unsurpassed mastery of the factory system. But by the late 20th century, the American factory system was in trouble, and our economy was losing out to those of Japan, Germany, and others. The American factory had to change; America's factory system of schools could not afford to be far behind.

The New Quality Standards

Productivity in the United States economy, the ability to produce ever higher volumes of standardized goods and services with the same or fewer resources peaked in the boom following World War II, pushing our national wealth to unprecedented levels. But gradually, as we entered the final decades of the 20th century, many of our economic competitors--especially Japan and western Europe--began to win market share in many key industries despite our superior productivity. The world economy was changing. Productivity had been the emblematic competitive standard among nations in the industrial age. Efficiency, productivity's homely country cousin, had been the standard for performance in individual organizations. After competitive losses in the 1970s, it slowly became clear that productivity was a necessary but not a sufficient condition for competitive success. In the 1990s productivity remains a good way of keeping score, but it is no longer sufficient as a competitive goal.

Since the 1970s, a new, more complex set of standards has emerged in U.S. competition with Europe and Japan, based on the economic experience of the vanquished nations after Word War II. After they dug themselves out of the rubble and began to rebuild, the Europeans and the

Japanese attempted to emulate the enormous U.S. economic successes generally attributed to mass production methods. That attempt failed principally because neither individual European nations nor Japan had domestic markets large enough to absorb high volumes of products. Both were forced to produce for more fragmented foreign markets. As a result they learned early to tailor products and services to a diverse international customer base. The evolution of flexible,

customer-focused institutions that emerged in response to fragmented markets ultimately spawned a competitive revolution. The Europeans and the Japanese were able to succeed by emphasizing a different competitive standard: quality, matching products and services to human needs, while consistently meeting high standards of performance.

Quality has become the emblematic competitive standard for an emerging economic reality that is here to stay. The reasons are varied:

- People at home and abroad are wealthier and can afford more than mass-produced standardized goods and services.[45]

- Growing wealth and the globalization of markets give voice to an increasing diversity of tastes that cannot be satisfied with standardized goods and services.

- People have more money in their pockets but less time to spend it, which means that people have neither the time nor patience for shoddy goods or second-rate services. Busy people want goods and services tailored to their specific needs and delivered conveniently.

- With the growth of two-earner families, more personal services like cooking and child care, traditionally done during time off the job, are being commercialized. People want personal services that are of the highest quality and tailored to their individual needs and tastes.

- In a more global and generally more competitive economy, if one supplier does not meet new consumer demands characteristic of the quality revolution, another will. In global competition, that other supplier is likely to be a foreign worker in a foreign firm. The competition to meet new consumer demands spawned by the revolution in quality also has opened up in domestic markets in both the public and private sector. Consumers who have their needs met in some of their dealings are demanding that all the institutions with which they interact meet the same standard of quality whether they are foreign or domestic, public or private.

The new quality mandates nine interrelated organizational performance standards:

1. Variety. Plain vanilla isn't good enough anymore. The once standardized offerings of mass production have given way to an explosion of choices to satisfy the growing diversity of demand in both domestic and global markets. Variety is evident everywhere: on the highways, at the newsstand, in the supermarket, and on the cable networks. Schools are no exception, as they struggle to satisfy the learning needs of special populations like the learning disabled and a student body of diverse cultures, ages, and educational interests in equally diverse local communities and economies.

2. Customization. Customization is the ability to provide for the wants and needs of the smallest group of consumers or for individual consumers--is a first cousin to variety. The demand for customization is satisfied in a variety of ways. It encourages short-run production in manufacturing, the automated teller machines, and the salad bar. In

schools, customization suggests teaching methods and curricula tailored to the needs, pacing, and learning styles of individual students.

3. Convenience. Because modern customers have more money than time, they crave user-friendly products and services. Convenience has two aspects. The first is convenience built in during the design of products and services by organizations that can empathize with customer needs. The engineer who designs the car should design to please the consumer and not to impress another engineer. Educators who design curricula should have students in mind and not their professional peers or the administrators who will do the buying. The other aspect of convenience is good old-fashioned customer service--convenience at the interface with the customer when the product or service is delivered. In education, convenience means delivering schooling in ways that are more flexible and accessible rather than the traditional, rigidly graded, lockstep sequences of 40-minute learning bites, delivered in passive groups, at a single site and in front of a teacher.

4. Timeliness. Competition based on time is more than being quickest to deliver pizza. It is the organizational ability to strip away unnecessary elements in production or service systems in order to deliver what the customer wants when the customer wants it. Timeliness begins with a focus on the customer rather than on the needs of the organization. Customers who have to wait while organizational needs are met will go elsewhere. Timely education is self-paced. Timely education is accessible and responsive to the needs of the fast learner, the eclectic learner who wants more range than depth, the employee who wants to brush up on basic skills, or the vocational student who wants a grounding in the humanities without putting in the traditional seat time.

5. Innovation. There are several races in the organizational competition to be innovative. The first race is the ability to get new ideas fastest. Americans are still the best at getting new ideas. We win most of the prizes for our new ideas, but as our competitors have demonstrated, organizations make their money and win customers not by being first to get an idea but by being fastest at getting new ideas off the drawing boards and into the hands of customers. The second race in the competition to innovate is the race up the learning curve to make continuous and incremental improvements in the product or service, improvements usually learned in the process of making the product or delivering the service and interacting with the customer. The final competition is the race to accumulate new learning and turn it into new applications and new waves of innovation. Ultimately innovation requires organizations that can learn from the bottom up as they make products, deliver services and interact with customers. As in most mass-production institutions, this kind of learning is difficult in education, where content is driven by the traditions of academic disciplines that discourage rapid innovation, where organizations are top-down and do not encourage learning from the bottom up, and where applied learning is isolated in individual classrooms and rarely shared.

6. Social Responsibility. As consumers are given more and more high-quality goods from which to choose, many want what they buy to do more than simply satisfy their material needs. They would like the goods and services as well as the organizations and processes that produce them to reflect their own values, and they want to see people like themselves

represented in the organizations that serve them. Increasingly, organizations are judged by their demonstrated ability to abide by non-economic values, including a respect for diversity in their hiring and responsible participation in their communities.

7. Consistency. This characteristic is at the heart of quality. Meeting quality standards some of the time is not good enough. Consumers give their loyalty to organizations that deliver variety, customization, convenience, timeliness, and innovation all the time. The ability to achieve consistency requires consensus on outcomes, standards, and measures. Achieving consensus on outcome goals and measuring outcomes are equally difficult in every industry, especially given the traditional emphasis on access standards in mass-production organizations. In mass-production organizations, where efficiency is the dominant standard for performance, there is a tendency to focus on the costs of technology and other inputs in the work processes rather than on the outcomes that occur in the use of the product or service. Mass-production systems are internally focused and reflect the perspective of cost-conscious managers. Quality organizations are externally focused and driven from the customer's perspective. Meeting consistency standards is especially difficult in highly fragmented industries such as education, health care, or construction because of the isolation of institutions and worksites. Fragmented organizational structures find it difficult to deliver consistent quality across a broad set of isolated delivery sites. Setting common measurable quality standards is the only way to overcome that isolation and to provide consistent quality.

8. Continuous Improvement. If consistency is at the heart of quality, continuous improvement is its lifeblood. Continuous improvement is the race up the learning curve that never ends. It depends on the ability of individual employees, groups of employees, and whole organizations to learn together. Much of that learning is incremental and experiential, and it occurs in the process of making the product, delivering the service or interacting with the customer. Continuous improvement requires organizational cultures and structures that are integrated by consensus goals and learning processes rather than by functional authority. Learning organizations move forward incrementally, continuously improving on quality performance.

Organizational learning processes are inevitably evolutionary not revolutionary. Successful learning in institutions begins with the development of a shared vision of the outcome, and proceeds one step at a time through the painstaking process of changing mutual expectations, building trust, and learning new behaviors. The process can be accelerated by emulating others who have already been through the process or are further down the road, but change processes in organizations are always experientially based and incremental.

The word continuously is important. Organizations are usually open to innovation and learning when they begin to manufacture a product or to provide a service. But once they have chosen a particular path of operation, they tend to become "path dependent." They find it difficult to be aware of different ways of operating and new methods of delivering quality. As a result quality may suffer. Thus any organization dedicated to quality must perform a delicate balancing act. It must

use scarce resources and available knowledge to pursue a path that is likely to be successful, without becoming blinded to other paths or unwilling to move off a path if circumstances warrant.

The Paradox of Path-Dependent Change

Continuous improvement along a particular developmental path does not guarantee success. Organizational change processes are not necessarily the gradual revelation of best alternatives. Change always proceeds on available information, and we cannot know the future. In any change process, several alternative paths are open at first; this availability of several paths can stall progress. For example, uncertainty as to whether Beta or VHS would dominate stalled commercialization of video cassette recorders until VHS became dominant because it won market share. State-of-the-art knowledge and accidental factors influence which paths are chosen. For instance, the United States uses water-cooled nuclear reactors not because they are better but because our nuclear capability grew out of U.S. experience in the Navy.

Once a path is chosen, experience tends to create "sunk costs." Long-standing investments in a particular technology or mode of operation make alternatives unaffordable. For instance, the cost of replacing the traditional automobile and the internal combustion engine would require throwing away investments in production technology as well as the complex infrastructure that produces gasoline and sells and maintains gas-powered vehicles. In addition, experience tends to be self-reinforcing, as alternative paths become overgrown and disappear. For example, the "qwerty" keyboard persists despite the superior Dvorak alternative. Moreover, in the final analysis, institutions can do everything right but be on suboptimal or dead-end paths anyway. Even the best buggy whip makers lost out to the automobile.
In a path-dependent world, it is difficult for organizations to initiate change and even more difficult for institutions to make changes with certainty. Sunk costs, the inherent uncertainty in futures, and institutional momentum always make it difficult to get off inferior paths and to strike out in new directions. The tenacious hold of the past is the greatest barrier to quality in both employer or education institutions. The best we can do in a path-dependent and uncertain world is to move forward on as many paths as possible while marshaling all the information available.

Change processes in education are subject to the same basic dynamic as in other organizations. The American education system has been on the same path for a very long time. Sunk costs and self-reinforcing experiences make it difficult to change educational institutions quickly. Moreover, it is early yet, and alternative paths are still emerging on the road to education quality. Happily, the localized structure of American education is ideally suited for nurturing alternative paths to reform, and state and federal authorities are in an excellent position to husband and disseminate state-of-the-art knowledge gained from the wealth of experiments in local schools.

9. Productivity and Efficiency. The old-time religion of productivity and efficiency is pursued differently in the context of quality standards. In old-fashioned mass-production organizations, productivity and efficiency were pursued by cutting costs, usually by "dumbing down" work through automation and using of cheaper, less-skilled labor. In organizations that pursue quality standards, cost cutting and efficiency are still important, but too much cost cutting is counterproductive. Organizations that cut beyond the fat and into the meat and bone of the organization can reduce their capacity to meet quality standards. Quality organizations balance cost cutting that allows them to be lean against investment in technology, organizations, and personnel that allows them to meet performance goals for variety, customization, convenience, timeliness, consistency, innovation, social responsibility, and continuous improvement.

Meeting the New Quality Standards

Experience to date in organizations that are meeting new quality standards suggests that a combination of factors is necessary: new flexible technologies, new high performance organizational formats, a more highly skilled and autonomous workforce, and labor-management collaboration. In addition, total quality management (TQM) techniques are required to integrate these new flexible technologies, work processes, and workforces.

Technology

New flexible technology, especially our old friend the computer, in its various disguises, is pivotal in meeting new quality standards at the least cost. We manufacture variety with a few keystrokes on numerically controlled manufacturing machinery. We customize services with flexible information-based software. User-friendly technology encourages convenience in both the design and delivery of products and services. Speedy organizations are integrated with flexible information and communications technology. Information technology monitors outcomes and encourages consistency. New technology frees up people from rote physical and intellectual tasks, leaving employees free to interact with co-workers and customers in the interest of making continuous improvements.

High-Performance Organizational Formats

New quality standards and new technologies require new organizational formats. A substantial share of quality improvements occurs down the line in the process of making goods, delivering services, and interacting with customers. In addition, the inherent flexibility of new technologies requires organizational structures and processes that are equally flexible. New flexible technology also tends to be widely distributed in quality workplaces--flexible manufacturing machinery on the production line and a computer on every desk in service workplaces. Technology that is flexible and widely distributed requires organizations that give employees up and down the line the autonomy and skill necessary to exploit technical potential.

In order to meet new quality standards and to exploit new technologies, successful organizations abandon large, centralized hierarchical structures that worked well when productivity was the overarching standard for economic success. Quality standards and the technologies that

accompany them encourage high-performance work structures that are more flexible and decentralized. Quality workplaces are integrated by shared information, common goals, and outcome standards.

High-performance work systems use networks integrated by common goals and performance standards to achieve simultaneously the competitive virtues of big and small organizations. Networks can marshal the wealth and market power of large-scale organizations and the customer sensitivity and creativity of small work units. Networks can overcome the bureaucratic tendencies of large top-down institutions and the isolation of fragmented institutional structures. Networks at the worksite, across the organization, and among interdependent institutions simultaneously encourage both integration through information and common goals and the autonomy of the separate individual workers, work teams, and organizations.

High-performance work systems work. Available data show consistently that work systems that combine participation, information sharing, consensus goals, flexible technology, skill enhancement, and strong support from the top out-perform traditional mass-production structures.[46] The human and behavioral basis of high-performance work successes is no mystery.[47] Authority-based work systems driven by cost cutting are a constant threat to job security. These organizations tend to be driven by fear and resentment, which create resistance to change and inhibit the learning and continuous improvement critical to meeting quality standards. High-performance work systems are driven by trust. In trusting environments, learning is encouraged and even difficult changes are more easily accepted because they are better understood.

Inside an organization, at the worksite, the basic building blocks of high-performance work systems are networks of individuals or "work teams." A work team can consist of as few as 3 or as many as 30 people. It is defined by a shared commitment to meeting an agreed-upon outcome that directly affects the overall quality of the final good or service.

One recent study described these work teams:

> A self-directed work team is a highly trained group of employees, from 6 to 18 on average, fully responsible for turning out a well-defined segment of finished work....Although work-team members demonstrate classic teamwork, they're much more than simply good team players. For one thing, they have more resources at their command than traditional teams do: a wider range of cross-functional skills within the team itself, much greater decision-making authority, and better access to the information they need for making sound decisions. Work teams plan, set priorities, organize, coordinate with other work teams, measure, and take corrective action--all once considered the exclusive province of supervisors and managers.[48]

These work teams, the smallest of the high-performance networks, are also the basic building blocks of larger networks inside the organization. At the organizational level, work teams are linked together by a common commitment to standards and a shared sense of responsibility for final products or services. At the organizational level, the process--how work gets done, who is

included in decisions, how standards of quality are arrived at, ensuring a shared sense of responsibility--becomes more important for achieving quality than the traditional functions of an organization: marketing, procurement, manufacturing, and the like. Quality organizations focus on perfecting the processes that connect everyone's work to customers, rather than on encouraging competition among the separate functional hierarchies. In quality organizations, the action is in the white spaces between the boxes on the organizational chart, not in the separate functional boxes.[49]

In turn, a quality organization tends to become a member of networks made up of other organizations that are its suppliers, customers, regulators, and financial backers. The rubber, steel, plastics, and electronics industries depend on auto sales. The banker depends on the health of the industries in the bank's portfolio. The schools are part of everybody's network because they provide everybody's workforce and everybody's neighbor. The schools "network" upstream with institutions that provide for students, including the family, the community, and other schools; and downstream with other institutions, including employers and the communities that depend on the school's graduates.

American education is ideally suited for the adoption of network systems. Education is already organized into a loose-knit hierarchy of federal, state, and local authorities and ultimately into relatively autonomous classrooms at the point of delivery. Network structures in education can preserve autonomy at all levels of the education system while providing efficiency and consistent quality throughout. Networks both within and among public schools can meet quality standards best. A variety of choices, customization, convenience, and continuous and speedy innovation are best delivered in network formats.

Shared outcome standards are the best way to balance autonomy and accountability in decentralized structures. The existence of shared outcomes is the critical element that distinguishes networks from structures that are merely chaotic and fragmented into isolated units that "do their own thing." Without a shared set of outcome standards, organizations are usually inefficient and provide uneven quality. The integration of networks is particularly important in schools. Decentralization, school-based management and other choice-based mechanisms that are not effectively integrated by quality-based performance standards risk unsound financial and personnel practices as well as greater racial and class segregation in American schools.[50]

A More Highly Skilled and Autonomous Workforce

Ultimately, new competitive standards, new flexible technologies, and the high-performance work organizations that house them require a skilled and autonomous workforce. In organizations that emphasize quality standards, all employees are allowed the autonomy they need to exploit technology in the interest of meeting new quality standards. As a recent study of work teams noted, "When employees are empowered to control their own work and to perform as much of the whole task as possible, their focus changes sharply. They understand how what they do fits in, they understand what the whole product is."[51]

Autonomy by itself is empty and frustrating. Autonomous workers must also have the skills necessary to perform. Higher skill levels are required everywhere, but skill gaps are most

noticeable among employees down the line. American schools and employers always have dedicated substantial resources to the development of white-collar and technical elites. Fewer resources are dedicated to the development of employees who work down the line in most organizations. Yet, in quality workplaces a substantial share of new quality standards need to be met by employees who work with new flexible technologies and work formats at the points of production, service delivery, and interface with the customer. These employees tend to come from that "other half" of the high school graduating class who get the least education and the least training on the job. As a result, quality workplaces must dedicate the most substantial increases in both education and training resources to non-college-bound youth on and off the job.

Total Quality Management (TQM)

Making sure that the new flexible technologies, the new high-performance organizational formats, and the more autonomous, better-skilled workforces function smoothly together to produce consistent quality and continuous improvement is not easy. Coordinating these new elements requires new management techniques. Some of the most promising are a group of related approaches that are generally known as total quality management.

High-performance work systems that simultaneously value autonomy and integration are a managerial paradox. Organizations cope with this paradox in several ways. Subunits can be integrated by standards, new communications and information technologies, mutually agreed-upon values and shared commitments, effective leadership, and shared information. TQM requires that managers relinquish control of work processes to work teams and instead provide integration through leadership and the monitoring of outcomes. Managers communicate standards and measure results, intervening to provide assistance and direction as necessary. Managers help articulate and communicate leadership strategy and act as listening posts to capture new learning as products are made and services delivered.

While each organization applies TQM in a unique way, there are several common principles:

- "The customer is the final arbiter of quality."[52] An organization must stay focused on satisfying the customer's needs.

- Management should set clear goals or "outcomes" that are tied closely to the ultimate objectives of high quality with zero defect and continuous improvement for the organization.

- Every organization should break down the desired outcomes into statistical measures and then constantly use these measures to evaluate progress.

- Employees closest to the daily operating procedures are in the best position to understand and improve the quality of those procedures. All employees are given the responsibility to provide quality and are held accountable for it. As a result, TQM functions largely through the use of decision-making teams that represent everyone affected by a particular process, ranging from those who supply raw materials to supervisors, workers on the

line, and customers. Any practice that puts up barriers between one part of the system and another must be eliminated.

- To encourage all employees to participate in helping achieve quality goals, employees are given sophisticated tools and constant training.

- TQM requires strong leadership focused on quality improvement to overcome inertia and resistance to change.[53]

Labor-Management Collaboration

Mass-production systems are a recipe for conflict between labor and management. The production of high volumes of standardized goods and services at least cost requires rigid top-down control, reduction of labor costs, and a dumbing down of work that inevitably collide with the interests of workers and their unions. Rigid factory models based on top-down power and authority tend to encourage confrontational responses from unions. According to Al Shanker:

> As long as schools are organized like factories, with the principal as boss, teachers will negotiate rules that protect them by limiting the principal's power. The way out of this situation is not to give principals absolute power but to move away from the factory model of schooling.[54]

Quality standards and the flexible technologies and workplaces that they require encourage worker autonomy and involvement. Quality workplaces presume trust, shared information, and higher levels of worker participation rather than confrontational relationships between workers and bosses. Unions can provide an intermediary structure to focus employee participation and an informed worker's voice in strategic decisions in quality workplaces. Indeed, in workplaces without unions, employers struggle to invent alternative structures to provide a worker's voice in strategic decisions. Quality workplaces require unions that not only represent workers in bargaining over wages and working conditions but also represent worker interests in strategic change and career development. Involved unions should not only protect workers' share of the pie, but also enlarge the pie in the interest of enhancing worker opportunity and long-term employment security.

The Dual Reform Agenda

Education and work reform go hand in hand. Unless the reform of schools and the reform of workplaces proceed at the same pace, we risk a mismatch between the supply of educated employees and the demand for them on the job. The overall employer demand for educated workers drives the supply. We can educate and train, but if the jobs that will use educated workers are not there, all of our efforts are for naught. At the same time, if demand for educated workers outruns supply, the price will be the loss of individual opportunity and of organizational competitiveness.

Education and Jobs

There is ample evidence that economic changes have greatly increased the value of education. New competitive requirements tend to encourage the use of more highly educated employees working with more powerful and flexible technologies and work formats. As a result, front line employees with high school plus a few years of postsecondary education tend to substitute for a much larger number of less-educated front-line workers with a high school education or less. Moreover, front-line workers are supported by an increasing number of highly educated sales, managerial, professional, and technical workers in more elongated "value added chains" necessary to provide quality, variety customization, convenience, speed, innovation, and social responsibility in the final value of products and services. Even in manufacturing, which is projected to decline by 518,000 employees by the year 2005, employment of professionals will likely increase by 230,000 jobs. Consider the following facts:

- In the new economic environment, production workers are more highly educated and work with a larger and more educated team to meet new competitive requirements. In 1930 the value of output per production worker in manufacturing was $22,000, compared with an output per production worker of $60,000 in 1993. Over the same period, the number of per production operators as a percentage of the labor force has dropped from 27 percent to 15 percent. In addition, in 1930 for every production employee there were 12 nonproduction workers in various industries necessary to make the final sale--4 more blue-collar workers in transport and 8 more highly educated workers in clerical, managerial, professional, and technical functions. Today, for every production worker it takes 21 nonproduction workers to meet new competitive standards. None of the 9 new workers are blue collar and all come from more highly educated sales, managerial, professional, and technical occupations. The 9 new members of the team consist of 2 new service delivery personnel, 5 new sales workers, and 2 managers, professionals, or technicians.

- The long-term trend in the structure of occupations favors postsecondary skill levels. Between 1900 and the present day, farmworkers have declined from 38 percent of the workforce to less than 3 percent. Operators and laborers have declined from 25 percent of the workforce to about 15 percent since 1900. Craft workers such as millwrights and

plumbers who tend to learn their skills on the job, peaked at 14 percent of the workforce in 1970 but have since declined slightly to about 12 percent. In general, the decline in operators and laborers and more highly skilled craft workers is explained by the increase in postsecondary educated technicians. The decline in operators and laborers is much more precipitous, because they tend to be less educated than skilled workers. Craft workers are holding their own because of their relative skill levels even as employers are substituting formally educated technicians for crafts learned on the job.

A more effective use of information technology and high-performance work systems explains the trend in service delivery jobs, which grew from 9 percent of the workforce in 1900 to a peak of 13 percent in 1970 and to only 13.75 percent of workers in 1992. Sales workers have grown from 5 percent to more than 12 percent of all workers, as demands at the customer level have increased in every industry. The same is true for clerical jobs, which peaked at 18 percent of the workforce in 1970 but have since declined slightly. Managerial, professional, and technical jobs have increased steadily over the century, from 10 percent of all jobs to more than 30 percent today.

- The need to meet new standards by installing flexible technologies and high-performance work systems has accelerated basic changes in the structure of occupations favoring jobs that require education beyond high school. Between 1962 and 1992, farmers and production workers declined by 4 percent and 10 percent respectively. Only 5 percent of the decline in industry and farm jobs was due to increased imports. The vast majority of job losses was due to productivity increases through the installation of new technology and modern work practices. Service workers increased by only 0.72 percent. Virtually all of the increase in jobs occurred among occupations that require college-level literacy and math skills. Sales, clerical, and administrative support workers increased by 6.38 percent. The largest increase in employment occurred among occupations that tend to require postsecondary education. Managers, professionals, and technical workers increased by 7.4 percent. The shift to more highly educated workers was universal. Today there are more managers, professional, and technical workers in service industries than there are production workers in manufacturing.

- Over the past decade, the scarcity of skilled workers has pushed up wages of those with postsecondary degrees and an oversupply of less skilled labor has driven down the wages of those with high school or less. College/high school wage differences doubled during the 1980s. The unemployment rate for college grads was 3.2 percent, compared with 6.8 percent for high school graduates and 11.4 percent for high school dropouts.

- Between 1992 and the year 2000, 89 percent of the jobs we will create will require postsecondary levels of literacy and math skills but only half the new entrants to the labor force are likely to possess postsecondary levels of literacy and math skill. As a result, we should expect to see a continuation of the pattern of a surplus of low-skilled workers, a scarcity of high-skilled workers, and an accelerating divergence between the wages of skilled and unskilled workers. Between 1992 and 2000, we will likely create 13.2 million new jobs, while losing about 1.3 million farm jobs and another half million production jobs virtually all to modernization and increased productivity. Of the 13.2 million new

jobs, only 1.5 million, about 11 percent will come in relatively unskilled service delivery occupations. The remaining 89 percent of the jobs, about 10.7 million, will come in occupations that require postsecondary levels of math and literacy. Among these 10.7 million, new jobs, about 41 percent of all new jobs will be created in sales, clerical, and administrative support occupations. The largest share of new jobs will come in managerial, professional, and technical occupations. We will create about 6.3 million such jobs over the period, about 47 percent of all new jobs. Interestingly, more than 80 percent of these new managerial, professional, and technical jobs will be created in service industries.

- Education barriers have dramatically reduced the ability of "trickle down" from economic growth to improve prospects for less educated workers. Economic growth still creates jobs but only for skilled workers in the upper tiers of the income distribution. In the 1960s, rapid economic growth reduced poverty rates by 10 percent. In the deficit-financed boom of the 1980s, the rising tide of economic growth did not raise all boats. By 1989, poverty had risen 1 percent over the 1979 level.

- In the 1950s and 1960s, a single production worker with a high school diploma could earn a "family wage"--enough money to support a spouse and child, buy a car, and own a home. In the 1990s it takes two earners, each with high school plus two years of postsecondary education, to achieve the family wage.

A variety of studies, however, suggest that the increasing demand for highly educated workers in the cutting-edge, high performance organizations that are responding to new quality standards may not provide enough jobs to support wholesale increases in educational attainment. The proportion of college graduates taking jobs that traditionally do not require a college education increased from 11 percent in 1968 to 20 percent in 1990. Moreover, although it is true that the fastest growing job categories require skills beyond high school, the vast majority of new jobs still come from turnover in occupations that do not require postsecondary degrees.[55] Analysis of skill demand by Larry Mishel of the Economic Policy Institute suggests that, on average, employees will need less than a year of education beyond high school by the year 2000.[56]

Frank Levy and a variety of other economists also point out that the wages of workers with postsecondary degrees are increasing relative to the wages of workers with high school or less, but there is more to the story. In particular, (1) the wage differential is due more to a decline in the wages of those with a high school education or less, rather than an increase in the wages of those with postsecondary education; (2) the disparity in the wages of workers with the same level of education has also increased; and (3) blue-collar unemployment rates that used to be three times as high as white collar unemployment rates are now only twice as high.

On balance, however, these more negative recent trends reflect short-term realities and do not conflict with the consistent long-term trend toward increasing skill and education requirements on the job. To a great extent these trends result from a long and tedious recession and a very slow recovery, as well as particular structural changes like defense downsizing, which has already cost

us a million-and-a-half good jobs and will likely result in at least another million lost jobs. As the recovery takes hold and accelerates the long-term trend in favor of more educated workers, labor will reassert itself aggressively.

The current restructuring of the economy is all the more painful because it occurs in an environment of constrained growth. When change occurs in the context of economic growth, it means better jobs. When change occurs in the context of slow growth, it brings less job security and oftentimes worse jobs. There was as much economic change between 1947 and 1973 as there has been since, if not more, but the recent change seems more painful. Overall productivity grew by 2.6 percent between 1947 and 1973. Manufacturing productivity grew by 3.0 percent on average, and service productivity by 2.3 percent over the period. These productivity changes occurred as a result of massive changes in technology, work processes, and job requirements. The changes were driven by equally massive increases in overall growth. Increased demand for products and services encouraged innovation and new technology which, in turn, encouraged increased skill requirements overall. Increasing demand allowed fast and radical change without job losses. Change was the worker's friend. Unemployment remained low and family earnings doubled over the period.

The current restructuring is all the more painful because we got started at least a decade late, and we are playing catch-up. The economic restructuring process in the United States accelerated in the 1980s, making up for a decade of relatively little innovative change in the 1970s, when inflation and demography discouraged competitive restructuring. After the 1973 oil shocks, growth and productivity declined precipitously. With low demand for products and service; employers had less incentive to innovate and invest, and so economic change slowed down.

Other factors shielded employers from competitive changes in technology, work processes, and skill during the 1970s. According to Frank Levy, inflation made investment in technology, educated workers, and organizations more risky relative to investment in financial assets and precious objects. As inflation reduced the value of the dollar, it made American products less expensive overseas, reducing innovative pressures from trade competition. Inflation also resulted in passive wage restraint. As the cost of labor fell, there was less pressure to innovate and use the more expensive, educated labor. An increase in the supply of labor as the baby boomers reached working age and women joined the workforce also reduced incentives to invest in technology and skill.

As productivity advances slowed and even turned negative, so did individual earnings. Inevitably, the value of skill and education slowed and declined in the mid-1970s. American families were able to maintain earnings by putting more family members to work, not by educating them. They also consumed goods and services that were bought by government deficit and consumer credit. The factors that shielded American employers from economic change began to melt away rapidly. Demographic increases in labor supply tracked off. Inflation and the falling dollar disappeared as a result of aggressive monetary restraint from Paul Volcker and the Federal Reserve Board. The intensity of foreign competition increased, especially in manufacturing, and employers in every sector were suddenly facing wage and benefits costs to be paid in real rather than in inflated dollars.

The need to innovate intensified after 1980. Employers began to use fewer but more highly skilled employees in combination with more flexible and powerful technologies and work processes to meet new performance requirements. At the same time, the relative value of postsecondary learning relative to high school education or less began to increase rapidly. Earning differentials between high school and postsecondary education doubled over the decade.

Manufacturing institutions were the first to respond to the new reality because of increased competition from abroad. Although they have not reached their 3.0 percent peak posted between 1947 and 1973, manufacturing productivity increases have exceeded 2.5 percent since the 1980s. Service productivity finally became positive in the '80s and has hovered around 1 percent since 1992.

Unfortunately, the restructuring of the American economy, reflected in the productivity data, has occurred in recessionary or slow-growth environments. Restructuring and the inevitable "downsizing" that accompanies it have resulted in increased output without a corresponding increase in jobs or wages, even for more skilled workers. Even in the current recovery, 80 percent of the increase in goods and services has been achieved without increasing either hours worked or jobs. As institutions become more effective as a result of restructuring, it will take more increase in demand for products or services to increase hours worked and create new jobs.

Until growth is substantial enough to encourage employers to increase hours worked and to hire new workers, earnings and job opportunities will not increase substantially among highly educated workers. In a slow growth economy, restructuring will continue to encourage employers to substitute workers with postsecondary-level skills for high school graduate. As a result, the relative wage differences between high school graduate and workers with postsecondary-level skills will continue to grow, but mostly because the wages of high school graduate will decline. With more robust growth, scarcity among skilled workers will result in more overtime and higher wages for those with postsecondary-level skills. The gap between high school-educated workers and those with postsecondary-level skills will grow both because of wage decline among those with high school education or less and because of wage increases among employees with postsecondary-level skills.

Rapid growth and a surge in demand for more educated labor is inevitable once the process of restructuring combines with more substantial growth. With inflation out of sight and trade expanding, the restructuring of American workplaces in favor of more highly educated workers is likely to continue and accelerate. The earnings gap between workers with more and less education will also expand. The pace of change and the extent to which it results in higher wages will depend on the rate of economic growth. With demand for goods and services expanding rapidly, employers will have powerful incentives to modernize rapidly. New investments in technology and the installation of high-performance work systems will increase the value of employees with postsecondary-level skills and decrease the value of employees with a high school education or less. With faster growth, the earnings gap between workers with high school and postsecondary education will grow. In addition, the relative scarcity of workers with postsecondary education will encourage wage competition and absolute increases in the earnings of such workers. Moreover, underemployment as well as unemployment rates among workers with postsecondary education should decline appreciably.

Staying On Track

Recent evidence suggests that the American economy is back on track, as economic innovation increases the value of education on the job. Acceleration in growth will only strengthen the relationship between economic growth and expanding skill requirements. If employers and educators are to stay on track they will need much stronger relationships. As a rule, the lack of a strong bond between schools and employers makes it difficult to track and to match education to job requirements. This reality accounts for much of the disagreement between leading employers, who see skyrocketing skill needs, and analysts, who see only incremental changes in aggregate data on skills. Without stronger relationships between educators and employers, we tend to rely on aggregate government data to assess requirements for skills. Aggregate data tend to understate changes in skills needed for existing jobs because they tend to count the jobs rather than to look closely at the changing tasks and technologies that define new skill requirements. The shift from mechanical to electronic skill requirements in existing blue-collar occupations is a recent case in point. Aggregate data also tend to focus on average skill needs, missing the cutting edge of skill change and even the evolution of whole new occupations. Consequently, schools tend to be slow in responding to changes in the skill requirements for existing jobs and the educational requirements for emerging occupations. The factory-floor evolution of manufacturing engineering as a new elite technical job illustrates how poor relationships between employers and educators slowed the evolution of a whole new high-skill, high-wage occupation.

The key element that drives quality education among our nation's competitors and is missing in America is an active involvement by employer and unions with the schools. Educational attainment is rewarded in hiring processes and continues on the job in western Europe and Asia to a much greater extent than in the United States.[57] Moreover, those countries have a greater tendency to introduce new technology to complement rather than substitute for human skill.[58]

Ultimately, our ability to our match European and Asian competitors' educational standards will depend on our ability to build a mutually supportive relationship between employers and educators. Market forces are already pushing employers in the right direction. This is evident both anecdotally and in quantitative indices. The fastest-growing job categories require skill beyond high school. Wage differences between high school and college graduates have more than doubled since the 1960s.[59] Evidence also suggests that growing investments in new flexible technologies increase complementary skill requirements. One of the most powerful determinants of productivity and wage differences is access to flexible, computer-based technology on the job.[60] Finally, recent studies suggest that the proportion of employers experimenting with skill-enhancing, high-performance work systems is growing rapidly and approaching a third of the U.S. workplaces.[61]

At this time, it is difficult to assess the fit between available skilled workers and skill needs because our information is relatively weak and because the relationships between employers and schools are weaker still. The problem is compounded by the fact that employers who do not use state-of-the-art human resource management techniques often misperceive both their skill needs and appropriate remedies.

For example, a small textile company in the South always hired its nonsupervisory workers directly out of the local high school and promoted from within. The president of the textile company complained that entry-level hires from the local high school were getting worse every year. On examination, it became apparent that both the problem and the remedy were more complex.

Ten years earlier only 30 percent of the students had gone on to college, and the best high school hires were in the upper half of the graduation class. Ten years later, when more than half the high school graduates were going on to college, the best available high school graduates were in the lower half of the graduating class. In addition, work processes and technologies for entry-level jobs had changed substantially over the decade. The entry-level education requirement for production workers had jumped from high school graduation to high school plus at least a year of technical training.

The remedy in this case, as in many others, is twofold: closer collaboration between the school and the employer and better human resource management by the employing organization. Both employers and schools need to develop better articulated educational and work-based skill standards, rather than rely on one-size-fits-all requirements for hiring. In addition, those standards need to be enforced by more careful human resource management practices in the workplace, beginning with more careful job analysis connected to state-of-the-art selection, appraisal, rewards, training systems, and career development.

If we are to match skills to job requirements, there is no substitute for stronger relationships between employers and educators Processes that benchmark skill change against the "best in class" at home and abroad can improve the match between skill and jobs and accelerate the emergence of high-wage, high-skill occupations. Linking educators to these same processes can create a dynamic standard for school curriculums. Stronger relationships can proceed, however, only when educators accept their critical economic role and when the mass of employers embrace the value of learning as a competitive principle.

Reinventing Schools

At the beginning of this century, schools had to change to serve the needs of the emerging mass-production, high-productivity, factory-based economy. As this century draws to a close, they must change again to serve the needs of the emerging new economy based on quality.

First, the current structure of schooling, which is based on the factory model, must change. Schools must become quality organizations. People who experience quality in their dealings in one key organization tend to want quality standards in all the institutions that serve them, including schools. Moreover, schools need to become quality institutions because the current structure of schools socializes students into the factory model, whatever the content of their courses or the skill of their teachers. Students will absorb quality skills only by operating in quality organizations.

Second, schools must turn out a much larger number of students who have the skills necessary to work in the new economy. Students need better basic skills, more applied occupational skills,

and a set of behavioral skills necessary to work in quality organizations. In part, students will learn these skills by spending their days in organizations that meet the new standards of quality instead of being in institutions organized like factories. But schools will also have to change what they teach.

In the old economy, knowledge tended to be organized and taught in ways that emulated mass-production methods. Education was separated from the real world, where knowledge generally was applied in complex, interdisciplinary ways. Once separated from real-world applications, knowledge was divided into disciplines to be learned in stairstep sequences from introduction to mastery. As a result, students know a great deal but do not understand how to apply what they know. Current curricula and pedagogy too often emphasize knowledge over understanding. To meet the needs of the new economy, schools will have to teach students how to apply knowledge to the real world. In other words, students need to understand what they know.

Meeting the New Quality Standards

To meet the new international standards of quality, schools will have to undergo as thorough a reform as workplaces. Schools will have to provide more variety, meeting the needs of our diverse interests, cultures, regions, and age groups. In particular, schools will have to offer students a variety of approaches to education. School districts may allow students to choose between public schools that emphasize different subjects--technology, the arts--or different teaching methods. There may also be schools within schools, different approaches within the same school buildings.

Schools will have to provide customization. Not all students learn the same way or at the same pace. Each of us comes with a unique set of intellectual, visual, auditory, kinetic, and tactile learning skills. Schools will have to do more to individualize curricula, matching teaching methods to individual learning styles. Creative uses of the computer and video technology will help make this possible. New modes of teaching that break down the old teacher-at-the-blackboard method and offer more applied learning formats will be required.

Variety in East Harlem

For almost 20 years, New York City's District Four schools in East Harlem have been offering variety to 15,000 students, the overwhelming majority of them black and Hispanic. In East Harlem, students are offered a choice of public elementary and junior high schools, each emphasizing a different subject or approach to learning.

In 1974, District Four's innovative superintendent asked Deborah Meier, a long-time teacher dedicated to school reform, to create her own elementary school. On two floors of P.S. 171, Meier set up Central Park East, an alternative elementary school where teachers would come to know their students well in small classes, where teachers would have autonomy, and where there would be no set curriculum.

Meier's school was followed by others, and by 1982 the district had 22 alternative elementary and junior high schools.[62] By 1990, 20 percent of all elementary students in the district, and all junior high students, were enrolled in alternative programs, amounting to roughly 60 percent of the students in the district.[63]

The schools vary in size and approach. For example, one school building that used to be a conventional junior high for 1,300 students has been divided into four alternative elementary and junior high schools: the Harbor Performing Arts School, the Talented and Gifted School, the East Harlem Career Academy, and the Key School.

By offering variety, the schools have improved. Test scores are up in East Harlem, dramatically in some cases. And according to one observer who took an in-depth look at the District Four experience, "Some of the students who travel to East Harlem from other parts of the city volunteered to me that for the first time in their lives they are being treated with respect by teachers. Teachers reported that the smallness and autonomy of the alternative schools enable them to identify a distinctive voice in each of their children and respond in kind."[64]

Comer's Customized Schools

"Middle-income children from better-educated families gain what is necessary to succeed in school simply by growing up with their parents," says Yale University child psychiatrist James Comer. "We want to provide some of those experiences in school for inner-city children."[65] To do so, Comer's School Development Program (SDP) customizes schools to fit the needs of inner-city students.

SDP, now more than 25 years old, works to prepare children psychologically for school. It also emphasizes a collaboration among school staff and parents to meet students' academic and social needs by providing poor children the support that some families cannot give them.

The SDP is built around three elements: a school-governance team of parents, teachers, administrators, and support staff; a mental-health team that includes mental health and other community service providers; and the active involvement of parents.

The governance team develops a comprehensive school plan and fosters a sense of community and a climate that support learning; it also runs staff development activities and assesses the program. The mental health team works to prevent problems and to deal with the needs of individual students. Parents work with staff to plan social and academic activities, choose representatives for the governance team, and take part in school events.

More than 150 schools in 14 districts in 12 states and the District of Columbia are participating in SDP, and the Rockefeller Foundation has committed $3 million a year for five years to extend the program to more schools. Comer and his staff train school personnel to implement the program in their own districts. Comer is exploring the possibility of creating a new nationwide partnership that would bring together political, economic, and social welfare organizations in support of education.

In addition, customized packages of educational and social services may be necessary for more students with special needs. Some populations of students will have to be provided with extra social services, not traditionally thought of as being part of the school's function. In order to learn, students need continuing support and encouragement. In the best of circumstances, this support is provided by the family and the local community. But for many students, especially the urban poor, such sources of support are sorely lacking. The schools will have to link up with community social service organizations to provide support services, or the schools themselves will have to develop the resources and expertise to give students the support they need.

Above all, providing variety and customization means that the schools will need more teachers, more technology, and more accessible learning sites so that each student can receive the individual attention required to learn.

Schools will have to provide convenience by being accessible to working parents. This means schools will have to run on more flexible hours and abandon the current calendar that was based on the farm cycle. Schools will also have to offer more convenient locations, perhaps opening classrooms closer to parents' workplaces. Schools will also have to use computer and video technology to bring the classroom to the students.

Worksite Schools

"I can punch out for lunch with my video camera and run right across the field to the school," said Patrick Dunn, who works at the post office in the main terminal of Miami International Airport.[66] The school his son, Corey, attends is located nearby, built by the airport authority and run by the Dade County School system. The airport pays for maintenance, utilities, and security, while the school system provides the teachers, desks, and books.

The airport school is one of a handful of workplace schools that have sprung up in the past six years, an innovative way to provide convenience to parents and students. The school stays open from 6 a.m. to 6 p.m. for kindergarten and first and second grades.

In Santa Rosa, California, the Hidden Valley Satellite School opened in February 1993, offering kindergarten and first grade classes to children at a local Hewlett-Packard electronics plant. The school, the first of its kind on the West Coast, was created by cooperation between Hewlett-Packard and the Santa Rosa School District. It was opened primarily to ease logistical problems for parents by making it more convenient for them to have close contact with their children's schooling.[67]

Schools must be timely. The lockstep sequence of educational institutions needs to give way to more flexible and self-paced learning systems.

Schools need to get innovations off the drawing board and into the hands of students faster. Schools must be able to respond quickly to the latest developments in technology and pedagogy and to install innovations in schools quickly.

Finally, schools must deliver social responsibility. For schools, this is the most controversial quality standard. Fierce battles are being fought over what values the schools should be teaching. At a minimum, schools must be responsive to the diversity of the populations they serve, and they must continue to try to encourage respect for diversity, tolerance, and community involvement.

Like businesses, schools must also provide these standards consistently and improve continuously the way they meet them.

A Benchmark For Research

A small private school for underachieving students with reading problems is improving teaching by giving its staff the most timely information available about the latest educational research.

The Benchmark School in Media, Pennsylvania, enrolls some 165 students ages 5 to 15. Thanks to the efforts of its founder and director, Irene Gaskins, it takes research out of the ivory tower and into the classroom. The school's commitment to research starts with its hiring policies. Gaskins seeks out teachers who share her dedication to research. Once they have joined the faculty, the teachers attend a two-hour seminar every week to discuss recent research findings. They also have the opportunity to work with a school research manager, who coordinates research projects done by Benchmark staff, supervises data collection, and provides help for journal articles.

In addition, the first half of the first Monday of each month is devoted to in-service training sessions for Benchmark staff. Outside experts, including some of the best-known experts on reading and cognition, conduct the sessions.

The teachers and administrators work with these and other outside experts on special projects that help the school and let the staff contribute to research. One result has been a schoolwide reading curriculum, the Word Identification and Vocabulary Development Program, which was featured in a series of videotapes produced by the University of Illinois.

As a result of its work, the school was awarded a three-year, $343,000 grant from the McDonnell Foundation in 1988 to develop a curriculum to teach the children skills they need in order to learn. The foundation gives grants in educational research. Its president, John Bruer, said, "Places like Benchmark are exceedingly important resources. It's a model of what we'd like to see more of: highly professional, motivated teachers interacting with the national research community."[68]

Teaching New Skills

American educators face a dual challenge. Like other employers, educators need to reform their own organizations to meet new quality standards. In addition, however, as they meet these standards themselves, they must produce much larger numbers of students who have the skills necessary to work in other industries where new quality standards must also be met. The latter challenge is daunting. New performance standards, flexible technologies, and high-performance organizational structures necessary to their achievement require skill increases of three kinds: (1) better basics, (2) more occupational education for non-college-bound youth, and (3) a new set of behavioral skills necessary for all workers.

The new quality standards require everyone on the job to have better basic skills. Moreover, employees need better understanding of how to apply basic skills to solve world problems. The best evidence of our problems with basic skills comes in comparisons with our competitors. Motorola reports that its cost for training workers in statistical process control is approximately 30 times the cost of training by its Japanese counterpart, because the Japanese come to work with better basic skills that allow them to learn more easily on the job.[69]

The combined effects of new performance requirements and the technical and organizational changes they engender are creating increased demands for postsecondary education. An increasing share of jobs requires college degrees. According to the Bureau of Labor Statistics, more than two-thirds of the 30 fastest-growing jobs and nearly half of the 30 occupations with jobs added require education beyond high school.[70]

Increased skills are being pushed from the bottom up. For instance, in manufacturing, technicians with a core electronic skill substitute for whole teams of assembly workers. In services, new technology reduces the number of low-level service personnel but creates entry-level professional jobs. Every new technology creates a new technologist in health care. Paper-and-pencil graphic artists have evolved into highly skilled computer professionals. In banking, tellers are being replaced by customer service professionals with two-year degrees in financial services.

Increased skills also are being pushed from the top down. Banks rely on junior-college-educated, customer-service professionals to perform functions that were once the province of college-educated banking officers. Work traditionally done by engineers is now done by technicians. Middle managers surrender authority to supervisors, technicians, and team leaders. The professions spawn the paraprofessions.

There is growing evidence of skill compression in the workplace toward the middle range of skilled jobs in every industry. The net result is growth in educational requirements somewhere between high school and college. The same forces are likely to increase skill requirements in education as new work processes and technologies create a new cadre of elite professionals, technicians, and paraprofessionals. New quality demands on teaching are likely to sort teachers into paraprofessional, journeyman, and master categories. The growing emphasis on applied learning will upgrade skill requirements in vocational teaching and add a new skill dimension for all education professionals. New learning technologies will require a whole new set of educational technicians.

The general growth of service jobs and the growth of service functions in every job also increase skill requirements. The increase in service jobs results from both the direct consumer demand for services and the expansion in business services necessary to meet new competitive requirements in manufacturing industries. The growth in service functions increases the volume of human interaction in the economy and places a premium on such behavioral skills as interpersonal and communication skills. As machines do more and more of the work, employees in every industry spend more and more time working with co-workers and customers to mobilize technical capability and meet new performance standards. As service functions increase in the economy, skill requirements increase; and as the overall level of human interaction grows, skill

gaps become more obvious. Better basics and more education for those who receive no formal learning beyond high school are necessary but certainly not sufficient for developing a workforce capable of meeting new quality standards. In addition, a new set of behavioral and occupational skills are required, especially for non-college-bound youth.[71] These skills are traditionally associated with white-collar and technical elites at the top of organizations but are more necessary for a broader share of workers in organizations. The key skill required to ensure quality is the ability to take responsibility for the final product or service in the organization in which one works--to follow through on tasks, take risks, and function successfully in flexible and ambiguous environments typical of quality organizations.

The ability to meet new standards for variety and customization also requires deeper behavioral skills--employees must have the problem-solving, creativity, and learning skills to handle the constant stream of exceptions.

Delivering convenience to customers or clients requires interpersonal skills. As already metnions, employees who do not interact directly with the customer have to be able to empathize with customer needs. The engineer needs to design the car for the customer and not to the standards of other engineers. Curriculum designers and school administrators need to design learning experiences with students in mind and not to impress professionals. Providing convenience in the delivery of the good or the service requires more traditional interpersonal listening and communications skills, which are easy to describe but hard to deliver in traditional organizations where everyone works for the boss and not the customer.

Efficient organizations that perform consistently and continuously require employees with strong interpersonal and teamwork skills. Organizational skills are necessary if employees are to work effectively in the context of explicit and implicit organizational cultures. The ability to lead and influence peers, bosses, and subordinates in the absence of clear lines of authority is critical. In high-performance organizations, employees need to accept the leadership role when their skill is required and relinquish that role when necessary, regardless of the status of team members. Moreover, in the context of the diverse American workforce, employees need to develop an awareness and a respect for differences on the job.[72]

In high-performance work systems employees more highly skilled employees working with powerful and flexible technologies assume a broader range of responsibilities. Such employees need self-management skills that allow them to set goals and meet them, establish priorities among responsibilities and tasks, and find their own motivation to meet performance standards.

Some people argue that the behavioral and applied skills listed here are not skills at all but innate human attributes that some people have and others do not. As such, they cannot be taught in schools, no matter how we reform education. In fact, everything we have learned in sociology, psychology, anthropology, and the other human sciences teaches us that these are, in fact, learned skills.

The difference between people who have these behavioral and applied skills and those who do not is that only some people have the opportunity to learn these skills. These are the skills we have

always demanded from the nation's white-collar and technical elites in supervisory roles in every organizational sector of American life.

Society and the schools have given these people, most of whom tend to be white and male, a set of expectations early in life to groom them for leadership roles later. Culture reinforces those expectations. The relatively advantaged among us, especially those of us who are white and male, see people who look like ourselves in leadership roles in every cultural, political, and economic institution.

Those of us who have education beyond high school are especially advantaged. We have an extra two to seven years for further intellectual and personal development in safe havens that protect and nurture us to lead and take responsibility for ourselves and others. Most who earn postsecondary degrees get jobs with broad responsibility and are judged not only for their technical competence but for their behavioral and applied abilities.

If we are to truly succeed in developing a quality workforce, we will need to change the way we relate to all our youth in our families, cultures, schools, and workplaces. Changing the structure of schools and increasing access to postsecondary education will help, but school reformers also will have to change the curriculum and pedagogy in order to include a stronger applied and behavioral dimension. Behavioral skills of the kind just described cannot be learned out of context. They need to be self-consciously integrated in curricula that teach basic academics and occupational skills. Moreover, they need to be taught in an applied context. A new curriculum should emphasize knowledge *and* understanding and should stress the application to the real world of what is learned in school.

Education expert Theodore Sizer, for example, stresses the important difference between readying students to display knowledge and expecting them to use knowledge.

> The difference here is more than semantic. Using knowledge assumes a student to be markedly active, inventive. Displaying knowledge can be done with relative ease by a passive student. Use requires the student to be a fundamental part of the process. Further, if to that purpose we add the objective of expecting the student to want to use knowledge-to be in the habit of acting in a knowledgeable way—the distance beyond display is substantial.[73]

Schools that prepare students for the new economy will have to teach them how to use knowledge.

How the Schools Are Doing It

How can we change the schools? The changes that are required are the same changes that are required for business: new technology, new organizational formats, a highly skilled and autonomous workforce, new management techniques, and labor-management collaboration.

Technology can be a powerful tool to help schools meet the new standards of quality. Technology has two major roles in the schools. First, schools can acquaint young people with the technology they will confront when they enter the new economy. To be sure, technology is changing so fast that students will probably never use at work exactly the same piece of equipment they used in school. But schools can give students a general familiarity with technology that is vital to their success in the modern workplace.

Second, technology can be used in the art of teaching. Although, the quality of learning ultimately depends on the quality of the interaction between a teacher and a student, technology can aid that interaction. It can also bring the lessons of the classroom closer to the challenges students will face in the workplace. As one recent report has stated:

> Computer software tools, such as word processors and graphing programs, can help organize and structure complex tasks for students. Video and videodisc technologies can provide visual examples of real world phenomena, events, and stories that students can use for problem-finding and problem-solving activities. Computer networking and satellite communications technologies can help promote local and long-distance collaboration and communication among students and teachers and can help them become part of the larger world of scholars and scientists. Within networks and through networks, students can create and have access to data-bases that can enhance their research. . . .The public nature of computer work in classrooms can help foster collaboration, discussion, and reflection. Some kinds of computer software can help students monitor and manipulate their own thought processes as well as demonstrate concepts that prove hard to grasp (e.g., what a median is). Other software allows students to simulate complex scientific, economic, or historical events, thus exploring the variables and relationships that constitute these phenomena.[74]

Technology can also allow people to learn at their own pace and speed and can free the teacher from the repetitive lessons that are sometimes necessary for more important tasks.

Apples for the Teacher[75]

Before starting school, new teachers in the Lake Washington (Washington state) public schools complete two weeks of summer training. Among other things, they are introduced to the district's instructional model and curriculum, and they learn how to use a computer. After the program, teachers can take their Apples home to keep--free.

Now that most teachers in Lake Washington know how to use computers, the district has focused its training on integrating the technology into the classroom. The district uses an instructional TV channel to provide training on some of the available hardware and software. Teachers can sit in the library and work with the equipment as they watch the weekly program, or they can watch at home if they have a cable hookup. A cadre of teachers and staff developers also provide technology training at school--without asking teachers to come in early or stay late. Schools periodically combine classes and hire substitutes for a half-day to free teachers for technology workshops. Other times, the principal and aides supervise student assemblies for an hour while the school's technology coordinator introduces a new piece of software to the staff.

Technology coordinators at individual schools are the heart of the Lake Washington schools' training program because they can offer onsite encouragement and advice. They meet once a month with the district's technology supervisor and another technology specialist to share ideas from throughout the district and learn about new technology applications. Then they go back to their schools and share what they have learned with their fellow teachers.

But the best training is often less structured, as when teachers discuss their ideas with each other informally, says Lou Cenname, a vice principal at two district schools. That was the idea behind giving the teachers free Apples: expose teachers to technology, and they will become the experts and pass their knowledge on to their colleagues.

Advanced technology has begun to enter the schools. But it is still not used widely enough or creatively enough to enable schools to meet quality standards. For example, the number of computers in schools in the past decade has grown tremendously. In 1991-92, 98 percent of schools reported having at least one microcomputer.[76] In 1989, high schools typically had between 40 and 50 computers, and the median elementary school had nearly 20.[77] Those numbers are surely higher today.

However, these numbers don't tell the whole story. Older types of computers still dominate in schools. Apple II and other eight-bit computers made up nearly 90 percent of elementary school computers in 1989, and roughly three-fifths of high school computers.[78] In addition, despite the increasing availability of a wider variety of software, most schools use software in fairly traditional ways. The largest proportion of instructional software in use today is focused on recalling facts and logarithms, instead of providing a learning environment for motivating higher-order thinking, problem solving, and deep understanding, as the new economy will demand.[79] According to one analyst, "Very little software provides sophisticated assessment of student comprehension and truly individualized feedback to the level of sophistication of even a mediocre teacher."[80]

Overall, despite their increasing numbers, computers are simply not used for very much instruction. An analysis by Henry Jay Becker, an expert on school computer use of survey data, reveals that "for any one activity. . .computers are used only a minority of the time. In most activities, they are used less than one-fourth of the time. Thus, computers in most subject-matter classes serve primarily as enrichment or for occasional individual remediation rather than as a major way the students learn to think and accomplish learning and understanding."[81]

An analysis by Congress's Office of Technology Assessment of distance learning paints a similar picture. Five years ago few states had projects in place or plans for K-12 distance learning; today almost all do. However, "many students and teachers still do not have access to needed but distant experts and information."[82]

Moreover, teacher education programs are not giving student teachers enough training in the use of technology. While 90 percent of teacher education programs now have computer laboratories, new technologies are seldom into methods courses for student teachers.[83] A survey by the American Association of Colleges for Teacher Education found that only 13 percent of students reported that computers were used "very often" or "often" in the instructional methodology they received during their student teaching. Fewer than one-third of prospective elementary teachers responding to the survey felt ready to teach with computers.[84]

San Jose State: Teaching Teachers Technology

San Jose State University in California is home to one of the education programs in the country that makes technology an integral part of the curriculum. Eight percent of the faculty members' offices at the college of education are equipped with personal computers. The college offers a wide range of courses that link teaching and technology, including "Curriculum Material and Technology," "Modules on Technology," and "Computers and Special Education Instruction," as well as training on how to use technology to teach handicapped children and instruction on how to use the software, HyperCard, which allows students to do their own programming.[85] The faculty is also tied into advarced computer networks that help members with their research and teaching.

Members of the faculty have also developed innovative technological tools, such as visual databases on laser disc for the arts and humanities, and a computerized sketch pad to rearrange shapes on an overhead projector. The college also broadcasts courses from a campus television studio to teachers taking classes at five local community colleges. The teachers can communicate with the professor and students back at the campus studio.

San Jose State also enjoys a clear advantage by being located in the heart of Silicon Valley. Local firms have used it as a testing ground for new products, providing the College of Education with millions of dollars of high-technology tools.

Although the schools need more technology to reform education to meet the needs of the new economy, just "throwing computers at the problem" will not be enough to make a real difference. Technology also must be linked to organizational change, with schools providing an environment that encourages innovative uses of the computer and other advanced technology. Consider, for example, a nationwide survey of teachers who are experienced and accomplished at integrating computers in their teaching.[86] The survey found that it takes fully five to six years of teaching with computers for teachers to master computer-based practices and approaches. It also found that "although barriers to the integration of computers have lessened for most of these teachers over the years, significant barriers still remain. The most serious problems for these teachers are inadequate amounts of hardware and of time to plan and carry out computer-based lessons."

The survey concludes that the accomplishments of teachers who are successfully integrating technology into the classroom could be realized on a wider scale only if three conditions occur: there is enough technology available for teachers to have unrestricted access, teachers have ample support and time to learn how to use it and plan for its use, and "there is a school structure and culture in which teachers are encouraged and expected to take a professional and experimental approach to their work."

To provide such a structure and culture, schools, like other workplaces, will have to adopt new organizational formats that emphasize flexibility and autonomy. Karen Sheingold, a director in the Division of Applied Measurement Research at the Educational Testing Service, has written,

> It is very unlikely that the widespread and effective use of technologies to promote active learning can take place unless schools can reorganize their own structures, priorities, and spaces. . . Seriously pushing the potential of technologies requires both a commitment to thoughtful innovation and a school community that supports such change. Restructuring can provide the context in which such innovation takes place....An organizational structure must be created in which authority and responsibility are aligned--in which those who are charged with getting the job done, namely schools and teachers, have the authority to do it. In the long run, this means that schools and districts must be accountable for achieving certain yet-to-be-defined outcomes, rather than for adhering to a set of procedural guidelines and regulations.[87]

New Organizational Formats

To use technology effectively and to meet the new international standards of quality, schools, like businesses, will have to move from a hierarchical organization to one that emphasizes autonomous nested networks. Inside each school, teachers will no longer be locked into strict procedures, curricula, and lesson plans given to them by a higher authority--the principal, the central school bureaucracy, the board of education, or the state. A Nation Prepared: Teachers for the 21st Century, a 1986 report by the Carnegie Forum on Education and the Economy, described how schools should be restructured:

> Within the context of a limited set of clear goals for students set by state and local policymakers, teachers working together must be free to exercise their professional judgment as to the best way to achieve these goals. This means the ability to make--or at least to strongly influence--decisions concerning such things as the materials and instructional methods to be used, the staffing structure to be employed, the organization of the school day, the assignment of students, the consultants to be used, and the allocation of resources available to the school. This autonomy will work only if the school staff work collaboratively, taking collective responsibility for student progress.[88]

At the classroom level, teachers will have more discretion about what to teach and more responsibility for the results of their teaching. Where appropriate, teachers will form work teams to pursue innovative classroom teaching strategies and make the best use of technology.

The work teams of teachers at the classroom level will then be linked into a schoolwide network. These networks will make many of the decisions now made by the principal alone, or by the central administration, the school board, or the state
--decisions about curriculum, staffing, teaching methods, education materials, and distribution of resources. At the school level, the networks also will include the principal and should involve the parents, who have the greatest stake in their children's education.

New Networks at the District and Building Level

The Marshalltown (Iowa) Community School District, a participant in the National Educational Association's Learning Laboratory Initiative, is attempting to restructure its schools by setting up shared decision-making networks at the district and building levels. All of the networks attempt to get teachers, administrators, and parents involved.

Beginning in 1989, the local union and district officials, in collaboration with the NEA, the American Association of School Administrators, Iowa State University and the Institute for Development of Educational Activities, set up a district-level Shared Decision Making (SDM) team, composed of a "vertical slice" of the school community: teachers, administrators, a school board member, a parent, a local businessperson, and local NEA representatives. The SDM team agreed on general goals for the district.

Then, at each of the 10 school buildings in the district, school improvement planning teams were created to set more specific objectives for each school. These building-level teams vary somewhat but include at a minimum the principal, a parent and a teacher. At the high school, the team also includes student representatives.

Once the building goals were agreed on, school improvement planning teams were put in place, one for each goal. The planning teams develop specific strategies to meet the goals. They also monitor progress and make adjustments. While these teams vary in composition from building to building and from goal to goal, almost all have representatives from each of the three main stakeholder groups.

"We really believe in collaboration. School improvement works when all those involved with the learner can work together and work building by building," says Phil Tetzloff, president of the Marshalltown Education Association.

Of course, like networks in business, those at schools will not just have greater authority, they will have much greater responsibility, too. Like workers in the new economy, teachers and administrators will be charged with achieving certain clear quality goals that are benchmarked to international standards. However, these goals will not be the traditional test scores imposed from above. Teachers, administrators, and parents will develop the specific measures of quality, which might include increasing the number of students who can write an effective essay, decreasing the number of dropouts, or increasing the number of students who can perform a successful science experiment. Teachers also will have a great deal of autonomy in deciding how to meet these goals.

School-level networks will, in turn, be linked to networks in other schools, to schools of education, to universities, and to social service agencies.

School reform expert Seymour B. Sarason has described the potential payoff of these new organizational formats in schools. "When a process makes people feel that they have a voice in matters that affect them," he writes, "they will have a greater commitment to the overall enterprise and will take greater responsibility for what happens to the enterprise."[89]

The good news for education is that many schools are already experimenting with or have instituted new organizational formats that clearly break with the factory model. The formats have different names--site-based management, teacher empowerment, restructuring--but all are characterized by decentralized decision making, with greater flexibility and autonomy for teachers.

School-Based Management: Promise and Problems

A February 1993 special report by Education Week took a close look at school-based management, one of the most widely adopted school reforms of the 1980s and 1990s.[90] It found that many observers agree that the reform "has provided a vehicle for greater parent and community involvement in schools, and that teacher morale has improved. . .."However, school-based management hasn't resulted in the kinds of dramatic gains in student achievement or in the innovation in classroom practices that their advocates had hoped."

These failures are due in part to the fact that "many districts have failed to create a framework in which school-based management can thrive. Frequently, little, if any, authority has actually been delegated to the school site."[91]

For example, many school districts started site-based management without defining what the role of the school work teams would be or how they would be linked to the districts long-range plans for improving student learning. One result was that too many of the school work teams become preoccupied with micro-management of such areas as school attendance, discipline, and building maintenance instead of focusing on the teaching and learning process. Another result was that the work teams simply became forums for the politics of interest groups (teachers vs. principals, parents vs. teachers, etc.) instead of developing a common vision for the school and working to achieve it.

In addition, says the report, "in many districts that profess to be engaged in site-based management, little real authority has been shifted to the schools." The report also found that school work teams have rarely been given the kind of ongoing training or data on budgets and student performance that they need to use their new authority and autonomy effectively. "But perhaps the biggest complaint by teachers and others," said the report, "is the amount of time that shared decision making takes--and the lack of rewards for their efforts." This is in stark contrast to worker participation reforms in business, where performance-based rewards are considered a key element in successful work teams. In schools, one result is that teachers serving on school-based management teams get rapidly burned out, and many quit early.

The report also notes that the shared decision making came to schools at the same time that schools were faced with massive budget cuts, meaning that the new work teams had to focus on retrenchment, not educational innovation.

Advocates of school-based management conclude that it can succeed, but not if it is just grafted onto schools that remain fundamentally unchanged. New organizational formats must be combined with major reforms elsewhere in the system. In particular, reformers call for devolving much more authority and autonomy to individual schools, with districts providing oversight over outcomes instead of inputs. There is growing interest, for example, in "charter schools," where groups of teachers and others form and run independent public schools under contracts with local school boards.

A Highly Skilled and Autonomous Teacher Workforce

Just as new forms of organization and new technologies mean that the importance of employees has expanded in business, they also mean that teachers will have a more important role in reformed schools. Clearly, teachers will have a much greater opportunity to have a positive or negative effect on efficiency, quality, and innovation. Teachers must know how to use their new responsibilities, to operate the technologies, and to feel comfortable in the new organizational formats.

One step in the direction of ensuring that teachers are prepared for their job would be for leading members of the teaching profession to establish standards for high professional teaching competence. The Carnegie Forum on Education and the Economy recommended establishing a National Board for Professional Teaching Standards that would certify professional teachers and set standards for teacher education.

The current system of teacher training badly needs reform. A 1991 report in Education Week called colleges of education the "weak link in the drive to improve the nation's schools." A recent survey of teachers found that fewer than 15 percent thought their undergraduate courses in education were a "definitely effective" source of job-related knowledge and skills.[92]

To give teachers the skills they need to teach in reformed schools, schools of education must provide more real-world experiences. Professional practice schools--clinical schools, similar to teaching hospitals for medical students, where teachers would combine theory with daily practice-would give teachers the skills they need to meet international quality standards.

A growing number of educators favor such schools, and several have already been set up across the country, usually operated jointly by a university and school district. In these new professional development schools, according to Teacher Magazine, "teachers and professors work side by side to induct new teachers into the profession and to engage in ongoing research about teaching. The professional school not only elevates and enhances the education of future teachers but also offers professional renewal for the teachers employed by the schools."[93]

Putting Student Teachers In Classrooms

"What we are really trying to do is change the way teachers make decisions. We want them to see teaching as a problem solving exercise, not a telling-students-what-to-do exercise," says Alphonso C. Mance, assistant executive secretary of the Tennessee Education Association (TEA). He's describing the Tennessee Teacher Education Initiative -- a collaboration among Peabody College; Vanderbilt University; the University of Tennessee, Knoxville; Memphis State University; and the TEA -- that gives student teachers real-world, classroom experience.

The teacher education program at each college emphasizes clinical practice, close cooperation between university faculty and K-12 teachers, and the use of classroom teachers as mentors for student educators. At the University of Tennessee, Knoxville, for example, student teachers are assigned to a classroom at the beginning of their first year. They start the year with almost no responsibility for teaching. With the help of a classroom teacher, the amount of teaching they do increases throughout the year, so that by the second semester, they are--in effect—performing all the duties of a full-time professional teacher. "It's more of a classical internship program than we've ever had before," says Mance.

At Memphis State University, six local schools have been identified as professional development schools. Each student teacher is assigned to do a full-time internship at one of the schools. "The professional teachers at that school are in essence adjunct professors to the education department," explains Mance. "They are teaching the student teachers the pedagogy from applications, not pure theory. The student teachers experience what it's like to actually work with students; they can make sense out of the theory they learned on their college campuses."

The initiative also emphasizes mentoring, not only by assigning individual experienced teachers to work with individual student teachers but by giving the experienced teachers special training. The teachers usually attend classes or seminars at one of the participating colleges during the summer or early in September so they can better support and instruct these students.

The Tennessee Teacher Education Initiative began with internships in 1990 and was up and running full scale in the fall of 1991. "Teacher educators have learned that if you really want to learn how to teach, you have to do it in a school," says Mance.

Total Quality Management

For schools, as for businesses, coordinating the interaction among the new flexible technologies, the new organizational formats and the better trained workforce to produce consistent quality and continuous improvement is a difficult task requiring new management techniques. Total quality management and related approaches applied to schools can be effective tools. Again, each school is different, but certain key features of TQM can help schools achieve the new international standards of quality.

First, schools should set clear goals for students, clear outcomes they want students to achieve and benchmarked to an international standard. They should then find a way to measure accurately student progress toward these goals, and use these measures constantly to evaluate progress. These measures are not the traditional test scores imposed from above that have little relevance to the real world of experience and work. Teachers and administrators, those closest to the learning process, should develop the measures, just as workers closest to delivery of products and services in industry develop measures of quality performance.

Second, teachers, the employees closest to the daily operating procedures of the schools, are in the best position to understand and improve the quality of those procedures. They must have a real say in setting quality goals and making decisions on which procedures are working and which are not. This is in line with the general movement toward greater teacher participation in management.

Third, the schools must focus on serving the need of their "customers." Identifying customers is more complicated for schools than for most businesses. For schools, students might be considered the "internal customers" of teachers, teachers the customers of principals, and high schools the customers of middle schools. The most obvious external customers include businesses in the community, colleges, parents, and other taxpayers.[94]

Finally, schools, like businesses, require strong leadership focused on continuous quality improvement to overcome inertia and resistance to change. That leadership will come from a collaboration among teachers, administrators, and parents working together at each school.

Outcomes, Not Inputs

The state of Florida is a leader in a school reform movement that is shifting the emphasis from inputs to outcomes. Traditionally, states have enacted specific regulations controlling how schools should allocate time and resources by setting the number of teachers, the content of courses, and even the specific methods of teaching that should be used.

But Florida and other states are beginning to focus on outcomes by setting broad standards for what students should know and be able to do, while allowing schools the freedom to determine how students should meet these standards. The schools are then held accountable for the students' results.

In 1991, Florida adopted "Blueprint 2000," establishing seven educational goals for its students that were modeled after the national educational goals agreed to by President Bush and the nation's governors in 1989. The goals focus on children's readiness to start school, the graduation rate, student classroom performance, the learning environment, the safety of schools, teachers and staff, and adult literacy.[95]

The blueprint also requires each school to do a needs assessment and to adopt a specific school improvement plan to meet the goals. In order to give the schools flexibility, the blueprint also frees them from many of the statutes that controlled much of their day-to-day activity.

The state legislature also created a commission on accountability charged with developing performance standards for each goal and with finding methods for assessing progress. The performance standards range from "Florida students communicate in English and other languages using concepts, prose, symbols, reports, audio and video recordings, speeches, graphic displays, and computer-based programs" to "Florida students work cooperatively to successfully complete a project or activity."

Accountability is also a critical part of the Florida reform. The blueprint provides that schools that fail to show sufficient progress after years will be subject to penalties.

TQM in Florida

The Pinellas County School District on the Gulf Coast of Florida is the seventh-largest school system in the state. Covering 389 square miles, it comprises 24 municipalities and 125 schools and employs 14,000 people. Its students come from a wide range of racial and economic backgrounds.

The district is the site of a National Education Association (NEA) Learning Laboratory, part of one of the key programs of the NEA's National Center for Innovation. Learning Laboratories are districtwide projects that aim to restructure significantly how learning takes place.[96] In 1991, the system decided to institute total quality management throughout the district.

In September of that year the district set up a design team of representatives from the local NEA affiliate, school district administration, and local business, which spent hundreds of hours developing a plan for total quality schools.[97] The district then created a District Quality Council, composed of the superintendent of schools, deputy and associate superintendents, the president of the PTA, and leaders of the NEA local association. The council was to integrate the diverse parts of the school system and keep its quality initiative on track.

The district targeted two sites to show that the system is serious about its commitment to quality. The entire staff of Rawlings Elementary School is being trained in quality management philosophy and techniques, and is to serve as a test site for quality management tools. At the same time, the district's central maintenance department is shifting to TQM.

To help support the use of TQM in all the schools, every school will be assessed to determine the type and level of training it needs to produce quality. The district is using trainers from businesses that use TQM, and it is preparing its own group of principals, teachers, parents, and central office administrators to help individual schools and divisions.

Better Collaboration between Labor and Management

The relationship between unions and management is more important in education than in most American industries because high proportions of school employees belong to unions. Overall, in 1991, 16.1 percent of American workers belonged to unions,[98] but 85 percent of teachers worked under collective bargaining agreements negotiated through unions. No significant change in schools will be possible unless the unions are involved, and no change will be effective unless unions and school administrators develop new ways to work together.

A recent study of labor-management relations in schools found that "most unions and school districts still negotiate over a relatively narrow package of items. Most act as if the consequences of collective bargaining are somehow divorced from the problems of school operation and student achievement." But the study also says that traditional relationship is changing. In a growing number of schools and school districts, unions and administrators are cooperating to "create workplaces of both dignity and productiveness."[104]

Such a change is critical to the future of the schools. "Unions are utterly incapable of empowering teachers to reorganize schools, to impose and monitor professional standards or to increase student achievement except by working through the school districts," says the study. "Likewise, managements are incapable of reorganizing schools, changing their schedules, or altering the duties of employees without also changing the labor relations contracts and work-role definitions of teachers and administrators."[105]

Teaching the Skills Necessary for the New Economy

The second half of the schools' challenge is to teach students the skills necessary for work in the new economy--academic basics, communication, adaptability, developmental skills, group effectiveness, and influencing skills. Education that emphasizes formal knowledge divided into disciplines can no longer be separated from the real world. Several kinds of changes will help bring more of the real world into the classroom.

Working Together in Pittsburgh

In the past two decades, labor-management relations in the Pittsburgh public schools have evolved from the traditional pattern of confrontation to a more cooperative relationship that institutionalized collaboration between teachers and administrators at both the district and the school levels.

After some bitter strikes in the 1970s, the local union, the Pittsburgh Federation of Teachers (PFT), and the school board gradually began to work to overcome their differences and see if there were ways in which they could work together to improve the schools. In 1985, the PFT and the district agreed on an innovative contract. As part of the contract, the PFT and the district entered into an agreement that launched the Teacher Professionalism Project. The name was later changed to the Professionalism and Education Partnership (PEP). The agreement pledged joint efforts toward greater teacher professionalism; a basic role for teachers in staff development; expanded professional responsibilities for continuing classroom teachers; and the involvement of teachers in the induction of new teachers into the profession.[106]

The contract was followed by major structural changes in labor-management relations. A district-level steering committee of 23 persons was set up to move the PEP project forward. Twelve members of the steering committee are appointed by the superintendent and the rest by the PFT. According to a recent report, "the steering committee operates differently from collective bargaining." [107] Meetings are much more collegial and less adversarial. Through subcommittees, the steering committee handles almost all the key issues facing the district.

At the school level, teachers, administrators, and nonteaching staff cooperate through "instructional cabinets" composed of teachers, the principal administrators, representatives of support services, and the PFT building representative. The cabinets review existing instructional policies, programs, plans, and procedures and develops new ones in areas that include curriculum, materials, staff development, and school activities.[108] Although each principal has a technical veto power, in practice, says one analyst, "most cabinets operate around jointly-made decisions."[109]

Linking the Classroom and the World Through Technology

Computers and advanced communications technology have the potential to vastly expand vastly the educational resources available to teachers and students by linking them to new sources of information. At Queen Anne's County High School, in a rural part of Maryland's Eastern Shore, students can use one of the library's 17 computers to search the card catalogue of nearly 150 CD-ROM databases.[110]

The library, or media center as the school calls it, also makes wide use of computers' networking capabilities. Approximately 170 computers in the school are linked to the media center and used by students or teachers sitting in their classrooms. The school is also experimenting with linking the media center with computers in the students' homes.

The center uses fax technology to expand student access. Students who need articles that are not in one of the school's databases can fax a request to the regional library and receive copies of the article by return fax.

Some other schools are beginning to make even greater use of the computer's networking potential. Students at the predominately black Vine Middle School in Knoxville, Tennessee, are linked to Internet, a vast computer network, supported by the National Science Foundation, that connects computer users and databases in 40 countries.[111] Internet is a high-speed, advanced "information highway" that links colleges, universities, and others to supercomputer sites and each other.

Students at Vine have used Internet to communicate with Israeli young people during the Gulf War, to talk with Russians after the failed political coup in the former Soviet Union, and to converse with scientists in the United States and Europe.[112]

Unfortunately, the technological applications at Queen Anne's and Vine are very much the exception, not the rule. While more than 20,000 school libraries use computers to handle book circulation, very few are as technologically as advanced as the Queen Anne's media center.[113]

Vine is able to use Internet because of help from the Oak Ridge Educational Network (OREN), an outreach program sponsored by the Oak Ridge National Laboratory. OREN gives schools the training and individual computer accounts that allow them to access Internet.[114] Most schools lack such support and find the cost of necessary training and hardware too great a barrier to overcome. Another problem is that few teachers are even aware of the network. As a result, although many colleges and universities are connected to Internet, only a few K-12 schools are similarly linked.

First, schools should emphasize what are called higher-order thinking skills. As Theodore Sizer describes them, "To oversimplify somewhat, basic schoolwork involves the systematic learning of skills--writing, drawing, reading, for example, and of simple, easily believable content . . . Higher-order thinking skills demand more of the student's own analytic and imaginative power; they involve understanding, judgement, abstraction, temporary suspension of belief, sophisticated concepts of causality."[115]

Creative schools and teachers are beginning to teach higher-order skills at all ages and levels of achievement. For example, Stanley Pogrow, an associate professor of education at the University of Arizona, has developed the Higher-Order Thinking Skills (HOTS) program, which uses computers and Socratic technique to teach higher-order skills to students at risk for academic failure. Such an approach helps students develop their communication and adaptability skills.

Second, as Sizer says, "The real world demands collaboration, the collective solving of problems."[116] Innovative schools are beginning to emphasize what has come to be called cooperative learning. A decade-long study in California, the Child Development Project, for example, is stirring interest among teachers. The project is based on research evidence that cooperation promotes higher achievement than individual competition, that developing social skills does not come at the expense of academics, and that children are more likely to follow rules that they understand and help formulate.[117] Cooperative learning approaches to education can therefore help students develop their group-effectiveness skills and "influencing" skills.

Two other approaches that try to bring more of the real world to school also are promising. The first is problem-based learning. Problem-based learning rests on the notion that if information is to be transmuted into knowledge, it is best acquired by solving authentic problems. Authentic problems are those that might be encountered in the real world and require a genuine, if less than ideal, solution. Problem-based learning requires students to do extensive research that takes them far beyond the boundaries of the typical classroom.

Problem-based learning can be applied to all age levels. At one elementary school in Virginia, for example, 2nd-graders are asked to solve the problem of rescuing the dying ecosystem of "Planet X."[118] At junior high and high school, students are tackling historical problems (e.g., should President Truman have used the atomic bomb against Japan?) or science-based problems (e.g., isolating the cause of a disease). This approach develops all the skills students will need in the new economy.

Another promising approach that gets students closer to the real world is the "microsociety" school. Microsociety schools operate miniature civilizations, complete with a legislature, courts, banks, post offices, newspapers, and a wide range of businesses. Students are employed by the microgovernment and businesses, earn in-house currency, and have to pay taxes and tuition and buy goods at the school's marketplace. There are now almost two dozen such schools with at least an equal number in the planning stage.[119]

The philosophy of the schools is to make teaching and learning more relevant by connecting knowledge to actual institutions aided by the use of mock currency as an incentive system.

Students usually have lessons in traditional academic subjects for part of the day and do their jobs at the microsociety's organizations for the rest of the day. Even the academic subjects emphasize real-world applications.

Microsocieties are one of the most direct ways to teach students the skills they will need for the new economy because they are coached in these skills and use them daily.

Learning from the Community

A school in Cambridge, Massachusetts, is teaching students the skills they will need in the new American economy by merging their classroom and their local community. The Rindge School of Technical Arts offers 9th- and 10th-graders the opportunity to participate in a special program, Cityworks, which uses the city of Cambridge as a kind of learning laboratory. To learn academic and vocational skills, students investigate local industries and commerce, services and people, neighborhoods and architecture.

"The message that we want to give kids," Principal Lawrence Rosentock told Teacher Magazine, "is to take chances and try new things, to work hard, and to do high-quality work."[120] Students in the program, which began in 1991, take many organized trips into their community, then re-create it in their classrooms by drawing maps; assembling photographs, tapes, and oral histories; and producing two-dimensional drawings and three-dimensional models of what they have seen.

In 1992 the students produced a detailed 8 x 14 ft. wall map of Cambridge, complete with battery-powered lighting. As part of their schoolwork, they designed a restaurant, figured out a location that would attract customers, and picked out the actual building in the city they wanted to renovate. Students then studied nutritional issues, including which types of food to serve. They made use of their graphic-arts studio to produce menus, placemats, business cards, and even T-shirts. After that, they proceeded to make a model of what the restaurant would look like and met with zoning officials to find out what types of permits and licenses would be needed.

Changing the System

Because schools around the country already are embracing many of the innovations discussed here, one might be tempted to think that the process of reform to meet the needs of the economy is already well under way. In fact, it is not. The overwhelming majority of schools operate pretty much as they always have. Innovation is the exception, not the rule. America has always had a smattering of model schools--isolated good schools that broke from the factory model to pursue innovative new policies. The system, however, has not changed significantly in almost a century.

Changing the system will require bold leadership to institute the kinds of changes discussed here on a wide scale. Several other changes are necessary to bring these changes to the entire school system and to implement them so that they will be long lasting.

First, the curricular materials teachers use will have to be changed to emphasize the teaching of skills needed for the new economy. This will be difficult because the adoption of schoolbooks and other course materials involves a complex interplay of local and state politics as well as conflicting philosophies about what should be taught. Nevertheless, it is vital. School boards and other bodies responsible for curricular materials must move away from rote learning to the newer approaches that emphasize student autonomy, responsibility, and real-world learning.

Changing California's Curriculum

California has taken some bold steps to institutionalize change by reforming its statewide curriculum. Beginning in the early 1980s, Bill Honig, then California's superintendent of public instruction, began an effort to overhaul the state's curricular frameworks, which set guidelines for what should be taught in schools.

State curricular guidelines are usually little more than lists of topics schools should teach at each grade level. But Honig wanted much more. He worked closely with the curricular commissions that were set up to produce the new frameworks, in an attempt to achieve a fundamental change in what went on in the state's classrooms.

California now has eight frameworks--mathematics, science, language arts, health, history and social sciences, foreign languages, the arts, and physical education. These frameworks call for changes in the way subjects are taught. In particular, the frameworks encourage teachers to move away from traditional approaches, especially drill and practice. They call on educators to teach students to think critically and to solve problems by covering fewer topics in greater depth. Moreover, instead of specifying topics that students must cover at each grade level, the frameworks state broad concepts and themes students should master.

In math, for example, computational skills are played down. The framework stresses exposing students to "strands" of mathematics--geometry, statistics and probability, logic, measurement, algebra, patterns and functions, and number sense.[121] The language arts framework emphasizes exposing students to literature and whole texts with less stress on phonics.

Institutionalizing change has not been easy. The reform effort has, so far, reached not quite two-thirds of California's teachers.[122] There have been bitter controversies over some of the frameworks, especially history and social science. Finding textbooks that reflect the new approach is a problem. Moreover, teachers have not yet received the kind of in-service training they need to fully master the new approach, and the state's assessment system has not changed to reflect the new curricula.

Still, many teachers and students are enthusiastic about the new approach. Most reformers believe the problems the frameworks face emphasize the need to change all pieces of the puzzle to make lasting changes in the system.

Similarly, teachers and administrators who are trained only for the old factory system of schooling will not be able to sustain a new approach to schools. The way we educate our teachers at colleges and universities must change along lines already discussed. Moreover, to ensure that innovation is continuous, teachers and administrators must have access to meaningful in-service training that will keep them up to date and encourage them to seek new ways to promote quality.

Schools also must be ensured of a continuing access to high technology, both to help them achieve quality schools and to help them expose their students to the kinds of technology they will be using in the workplace. There has been a tendency in the past for schools to be forced to make do with old and cast-off computers and other technology. Schools will not be able to achieve quality if this practice continues.

Finally, our schools will have to change to a more explicit focus on the needs of non-college-bound students, shifting resources to help them. Currently, the public spends an average of $19,940 to educate young people ages 16 to 24 if they go to college, but only $9,130 if they do not.[123]

In addition to spending more on the non-college-bound students, our school system must be changed to focus more directly on these students' needs. Schools must be linked more closely with business to help students make a smooth transition to the workplace. Vocational education is now a kind of ugly stepchild of our education system. The National Journal recently noted that "vocational education has acquired a pretty dismal reputation as an irrelevant corner of the high school curriculum--over-the-hill instructors teaching unnecessary skills on outmoded equipment--that frequently has been used as a dumping round for dim, unwanted, or troublesome students." Vocational education must be dramatically upgraded to become more like the apprenticeship systems used in Germany and other European nations.

The European systems, however, tend to be elitist and rigid. Students take exams in their early teens and are separated into university and vocational tracks in accordance with the results. Students on the vocational track have almost no chance to move to a university. An American system will have to be more egalitarian and allow more mobility. In Pittsburgh, for example, vocational education is thriving, in part, because vocational students have the opportunity to go on to college to study electrical engineering and computer-assisted design.

The Clinton administration has promised to give a helping hand to vocational education and to introduce an apprenticeship proposal. Growing numbers of educators and businesspeople believe it is time to strengthen the ties between school and the workplace.

Integrating Academic and Experiential Knowledge

The constant tug between "academic" and "applied" learning is another inherent tension between the missions of the educator and the employer. Educational institutions are the principal secular organizations for storing and transmitting human knowledge. Much of that knowledge has no economic value but is critical to the operation of the community and political system, such as the teaching of history. Products and services were reduced to their component parts to be

manufactured piecemeal and assembled into final products by authoritarian hierarchies. Only those at the top of the hierarchy understood the whole product. Similarly, knowledge was removed from its real-world context, broken into an ever-expanding number of disciplines and reduced into its component parts to be learned in a hierarchy from simplest to most complex. Only those who scaled the dizzy heights of postgraduate specialization had any hope of understanding even a single discipline.

Frederick Taylor personified the new industrial ethos, and Edward Thorndike was his counterpart in American education. Thorndike developed a behaviorist theory of learning in which every question had a right answer. Right answers were rewarded and wrong answers were punished in tests usually graded in screaming blood-red ink. Thus the organic bonds between the worlds of work and knowing were severed and dissected into inert pieces.

An accumulation of new findings in the cognitive sciences constitutes a critique of traditional learning in the industrial age and a framework for a new, more experiential pedagogy more appropriate to the emerging ethos of the postindustrial era.[124] In combination, these findings challenge our basic assumptions about how people know and use knowledge.

The most serious indictment of our current reliance on an academic pedagogy separated from the real worlds of family, community, and work is the apparent lack of transferability of learning between school and external environments. People who can solve book problems in school do not use the same methods to solve similar problems in the real world.[125]

Studies of experts show that they rarely use theories and principles learned in schools to solve problems in their areas of professional expertise.[126] Nor does learning on the job translate into academic performance. Dairy workers almost flawless in their math perform the same operations badly on arithmetic tests.[127] Brazilian street vendors solve 98 percent of math problems correctly in context but their success rate drops to 37 percent when math problems are taken out of context and presented in standard academic formats.[128] People who can easily figure out complex scoring schemes at race tracks and bowling leagues and make best-buy calculations find it difficult to perform the same mathematical operations out of context when presented in standard academic problem formats.[129] Sue Berryman and Thomas Bailey, in their review of current cognitive research, attribute poor transferability of learning to a variety of factors that we summarize as follows:[130]

- Academic learning formats are too passive. As Piaget argued, learning occurs in direct interaction with environments. Experience is the best teacher, and passive academic formats discourage experiential learning through exploration, discovery, and invention. Passive learning discourages engagement. Learning becomes the teacher's responsibility and not the student's. Passive learning formats frustrate, bore the learner, and encourage waiting-it-out behaviors "as when a bus is late or during sermons in church."[131] In the worst cases, passive learning formats contribute to motivational and behavior problems. Teaching becomes an exercise in crowd control rather than learning.[132]

- Academic learning is too fragmented, isolated, and focused on teaching bits of information out of context. The fragmentation of learning robs information of the broader context and meaning that give knowledge authenticity. In the absence of context and meaning, learning is confined to uses in academic settings.[133] According to studies done by the Educational Testing Service (ETS) and others, students know how to perform mathematical operations but don't understand how to use those operations in real-world applications.[134]

- The behaviorist model embedded in academic learning focuses too much on what the right answer is and too little on how answers are arrived at and what they mean. An emphasis on getting the right answer ignores the learning that occurs in exploring the alternative paths to both right and wrong answers. Our models of the most effective kinds of learning come from what we know about learning among young children, traditional apprenticeship, learning at work, and attempts to build experiential aspects into traditional academic curriculum.[135] The extraordinary pace of learning among children validates the power of experiential learning formats. Analysis of learning among children attributes their extraordinary progress to learning in context, guided by a community of parents, friends, and peers, and driven by a need to find meaning and to structure their experiences.[136] Successful learning in traditional apprenticeship appears to be driven by context, community, and meaningful purpose. In addition, traditional apprenticeship supplies opportunities for immediate practice, informal trial and error, status associated with achievement and mentoring by adults.[137] Both formal and informal learning on the job exhibit similar learning advantages because they are embedded in experience and a community of purpose, and result in immediate feedback in performance and standing in the group.[138]

  Experimentation with experiential formats has also extended to the schools. Cognitive scientists have experimented with experiential designs for traditional academic subject matter including mathematics,[139] reading,[140] writing,[141] history,[142] and science.[143] In addition, there is a long history of applied experience in the 4-H movement, vocational education, and cooperative education, as well as in more modern variants, such as magnet schools, tech-prep, career academies and the integration of academic and vocational curriculum by the Southern Regional Education Board (SREB).

The Current Context

Integrating academic and applied learning has assumed a new urgency in the current environment for two reasons. First, as just summarized, research findings in the cognitive sciences assert without qualification that a more experiential and applied pedagogy improves superior learning, irrespective of the economic or social context in which skills will ultimately be used. Second, the organization of schooling always need to be aligned with the organization of work, in order to fulfill both the educator's and the employer's mission in American society. Evidence of substantial change in the organization of work continues to accumulate, suggesting that schooling as presently structured may be out of sync with a new economic ethos, leaving employers and school graduates without the skills they need to succeed in the new economy.

Although there is a convergence between new research in the cognitive sciences and new functional requirements in cutting-edge, high-performance workplaces, the dominant pedagogy is still producing workers for traditional workplaces. In traditional workplaces, where jobs are designed narrowly and tasks are repetitive, there is little need to transfer general knowledge to a series of unique applications. In high-performance work systems, however, machines perform all the repetitive mental and physical tasks, and people spend their time deploying machine capabilities to produce variety and customize products and services. Workers must be able to transfer knowledge and prior experience to handle a continuous stream of exceptions. Every short production run or customized service is different and requires the transfer and tailoring of accumulated know-how to solve problems creatively.

The hierarchical authority of the teacher instructing passive students is not unlike the world of bosses and workers in traditional workplaces. In both cases, passivity breeds boredom, poor performance, absenteeism, and sabotage. In high-performance work systems, employees are involved, not passive. Employees participate in the setting of outcome standards and take responsibility for the quality of final products and services. Employees are also active participants in learning processes that drive continuous improvements, especially employees down the line at the point of production, at the point of service delivery, and at the interface with the customer where most incremental learning occurs.

Traditional pedagogy isolates students row on row looking at the back of other students' heads. Every student competes with all others in the war for grades and advancement. The classic image of the traditional assembly line is that of workers shoulder to shoulder facing the machinery they tend. Similarly, in traditional workplaces, individuals are assigned specific and separate responsibilities, and performance is judged one employee at a time in the competition for wages and promotion. In both cases, teamwork is discouraged, information is hoarded, and the high-performing "rate busters" are resented. In high-performance work systems employees work face to face, machines do the rote work, and people are left to deploy machine capabilities, spending most of their time interacting with co-workers or customers. Workers are more autonomous in order to exploit more flexible work structures and technologies. Because of the higher levels of human contact, work tends to be more social and organized into teams. Thus, performance and rewards are attached to groups and not individuals.

Traditional learning emphasizes correct responses to sets of particular questions. Similarly, traditional workplaces assign well-defined tasks and teach skills to match each task. More skilled workers are assigned more tasks and more skills, but roles are no less defined. Broader institutional goals and context are left to senior managers and technical personnel at the top of the organizational pyramid. In modern high-performance work systems, job assignments are overlapping, more open-ended and ambiguous. Everyone understands his or her role in the broader context of the entire work process from product design to customer, as well as the organization's strategy and vision. Everyone is responsible for the quality of the final product or service.

Traditional pedagogy emphasizes right answers, with less attention to learning from mistakes and understanding processes for arriving at answers. Performance standards derive from tests that quantify and encourage right answers. The focus on right answers encourages superficial learning, and tests substitute for more applied diagnostic tools that can provide deeper assessments and prescribe further development. Similarly, traditional work structures emphasize performing assigned tasks without attention to alternative ways to get the job done that would improve work processes or product quality. Performance assessments are based on the ability of employees to finish tasks on time. Alternatively, in high-performance systems more attention is paid to understanding and improving work processes in the interest of embedding quality in the production process, rather than counting defects after the work is done.

The Transition from School to Work

The current debate centered on the "transition from school to work" has quickly evolved into a dialogue that has already outgrown its billing. To begin with, the phrase suggests an older economic reality, when peoples' lives divided into schooling in childhood, adolescence, and early adulthood in preparation for the final two-thirds of their lives at work, with relatively short retirements that included neither work nor school. In fact, people mix work and schooling from adolescence through retirement. For instance:

- Thirty-two percent of high school students and 46 percent of full-time college students are working and going to school at the same time.[144]

- Five percent of full time undergraduates and 30 percent of part-time students in postsecondary schools are over the age of 35.[145]

- More than 40 percent of working Americans have had some training since they came on the job. Thirteen percent get some or all of their retraining from schools, 16 percent from formal company programs, 15 percent from informal training on the job and 7 percent from other sources such as professional societies and community organizations.[146]

- About 20 percent of courses taken in high school are vocational.[147]

- There were 442,000 associate's degrees awarded in 1991, most in vocationally oriented programs.[148]

More and more Americans mix work and learning throughout their lives, but the transitions are abrupt and haphazard. This was not always so. Young people worked on the family farm or in the family business or within walking distance of the factory where their parents worked, making objects they could see and touch. The decline in agricultural and manufacturing employment, the increase in service employment and service functions in every industry, and the shift from mechanical to electronic have made work more abstract and conceptual. Changes in the nature of work in combination with new transportation and living patterns have made work ever more remote and abstract.

The disconnection between schooling and the real world of work makes for difficult transitions at any age, but is most difficult for young people who make the leap for the first time--and most troublesome for non-college-bound youth. College-bound youth tend to have college-educated parents who provide encouragement to pursue postsecondary education as a means to encourage opportunity and to pass on middle-class status. Many college-bound students do not find academic learning any more relevant than non-college-bound youth, but they read and study *Silas Marner* anyway because parents and teachers tell them "they need it for college." Moreover, they enter the world of work at a later, more mature age after four or more years of extended development, and many are able to use family and peer networks to find their first career job. Many non-college-bound students come from families in which the parents have jobs in industries in decline or jobs that increasingly require technician-level skills that, in turn, require conceptual and technical learning beyond high school. They also enter labor markets at an earlier age and are essentially on their own.

Understandably, the dialogue on "school-to-work transitions" ends up focused on non-college-bound youth. As a result, the discussion of school-to-work transitions also raises the perennial issues around "dualism" inherent in the separation of academic and vocational tracks in American schools. The academic track is for the college bound. College graduation is the brass ring in American society. Those who finish college earn higher status and more money. More than 60 percent of us go to college but less than a third graduate. The vocational track is generally regarded as second rate, intended for students who aren't going to college. In order to keep the college option open, many parents and students opt for a third "general track" that represents a watered down version of the preferred academic pathway.

Critics of proposals focused on strengthening the school-to-work transition argue that an emphasis on school-to-work initiatives will encourage further tracking of college-bound and non-college-bound students. At the same time, there is an apparent need for more and better education for non-college-bound students, both in the interests of economic competitiveness and of promoting opportunity for students who don't go on to college. Non-college-bound workers who use new flexible technologies to make the products, deliver the services and serve customers are critical to meeting new quality standards. As a result of new standards, technologies, and organizational formats, the greatest skill gaps in American workplaces now occur down the line at the point of production, service delivery, and at the interface with the customer, where non-college-bound workers are concentrated.

In addition, all the available evidence demonstrates that opportunity and earnings are plummeting for young people who don't get some formal learning beyond high school. The variety of school-to-work programs reflects an attempt to equalize opportunities for college-bound and non-college-bound students. School-to-work programs have an applied bias and direct connection to employers that encourage work opportunities. In addition, the direct link to work and the creation of a separate community of learners characteristic of most school-to-work programs provides information, motivation, and support that are often missing in low-income families or in families with non-college-educated parents.[149]

Building Career and Learning Paths

The current school-to-work dialogue is caught on the horns of a dilemma. Critics fear tracking in programs for non-college bound youth and want to keep the college option open, yet the current system is clearly failing those who do not go on to college. In order to respond to the legitimate concern for keeping the college option open and to move beyond the current paralysis on policies for serving the needs of non-college-bound students, we need to refocus the current dialogue on a broader vision of a lifelong learning system in which school-to-work programs are not a cul-de-sac but an alternative path to both work and, ultimately, four-year college education.

The lifelong learning system needs to combine work and learning in education in much the same way that work and learning are already intertwined in the lives of students and employees. The first step in removing the dualism in American education is to end the dualism in current curricula. The happy convergence of new work requirements and new findings in the cognitive sciences suggests a new pedagogy that combines academic and experiential learning. In addition, the growing interest in community service and the willingness of American employers to work with the schools in order to get the employees they need provides a historic opportunity to end the academic isolation of American schools from the community and the workplace. In combination, these factors suggest the need for a seamless weave of academic and experiential learning that increases opportunity for both employment and further education.

Ultimately, the vision of a lifelong learning system that combines work and learning will be judged by standards that measure its ability to increase choices and opportunity for students, as well as its ability to satisfy performance requirements on the job. The diversity among American students, workplaces, and communities requires a variety of alternative pathways in a system of lifelong learning that promotes continued human development in schools and on the job. Standards for high school graduates need to be set at levels that make students both employable and prepared for postsecondary schooling. Standards for postsecondary schooling outside the four-year college system should both enhance job prospects and qualify graduates for admission in a four-year college or university. In addition, colleges and universities need to recognize the academic value of formal and informal learning at work in their admissions and course credit policies.

Everything we know about work and learning suggests that this more flexible approach combining schooling and experiential learning will work for both students and employers. Combining work and learning encourages more of both. Oftentimes, learning in school does not have to match up with job requirements in order to create job opportunities. In Germany, for instance, 40 percent of apprentices do not work in the occupations for which they were trained. Employers are still willing to hire them because they know that the apprenticeship system provides basic skills that make workers ready for work and learning on the job.

The abilities to work and learn encourage retention in schools. More schooling encourages employment security and higher wages, which in turn encourage more schooling both for more highly educated workers and their children. Education always begets more education. People who buy fishing licenses are people who have been fishing before. Grade school graduation leverages demand for high school graduation. High school graduation leverages demand for postsecondary schooling. Two-year degrees leverage demand for four-year degrees. Levels of education correlate directly with both the demand for and the availability of formal and informal training on the job.

Getting from Here to There

Policy discussions on breaking the traditional barrier between academic and applied learning and extending more learning and work opportunities to non-college-bound youth usually end up focused on Japanese models that connect academic achievement for all students to employment and on west European models that provide virtually universal access to postsecondary apprenticeship for non-college-bound youth. Our ability to adopt the Japanese model will proceed apace with the growth of stronger relationships between schools and employers who are willing to hire in accordance with recommendations from teachers, which are based on school performance. In addition, neither the Japanese nor the Europeans have gone much further than we have in mixing academic and experiential learning for college-bound students. The European systems for educating non-college-bound students are much more impressive than our own. Yet the sheer bureaucratic scale and costs of the European apprenticeship systems; the unique relationships between unions, government, educators, and employers that govern them, and their tendency to track students by social class suggest that we are unlikely to import any of the European systems anytime soon.

Although, the Japanese and Europeans provide a useful benchmark, our own reforms are more likely to grow through evolutionary improvements in the increasing variety of approaches in the American education system. Building a reform strategy around evolutionary and different approaches is probably both prudent and realistic. One-size-fits-all reform discourages innovation by reducing the number of developmental paths. In addition, one-size-fits-all approaches ignore the variety of needs and conditions in the American community. Moreover, standardized reforms tend to reduce the commitment and involvement of stakeholders including students, parents, educators, communities, and employers.

An incremental and varied approach to reform does not necessarily result in chaos, a slow pace of change, or lack of scale in reform efforts. Educational reform based on incremental improvements in a variety of approaches need not be chaotic so long as every approach strives toward a common framework of ultimate outcomes. We believe that there is broad agreement on the following four outcomes:

- Equity. Educational programs should provide alternative paths available to a broad cross section of learners. These paths should lead to work opportunities without foreclosing further career development or schooling that leads to four-year college graduation.

- Involvement. Programs should be designed, delivered, and evaluated with the full participation of stakeholders including students, educational professionals, parents, community representatives, and employers.

- An Integrated Pedagogy. Curricula should reflect a balance between the traditional academic and a more experiential pedagogy. A more experiential approach in schools should be balanced with learning experiences outside the classroom, including applications in the community and in the workplace.

- Certifiable Standards. All learning should lead to certifiable performance standards that include applications and demonstrations in an applied context.

Make 'em, Bribe 'em and Show 'em How

The development of a framework of principles and outcome standards can provide cohesion in a reform structure that is decentralized and varied. A framework of principles by itself, however, will not expedite progress or create scale in the reform movement. In order to accelerate progress and create scale, the framework for reform needs to be attached to a variety of efforts to "make'em," "bribe'em," and "show'em how." As mentioned earlier, "make'em" strategies include mandates to meet new standards set at the federal, state, and community levels and attached to certification and funding. "Bribe'em" strategies provide the path of least resistance; they include new program funding to assist in meeting mandates or to promote new practices. "Show'em how" strategies require the development of new collaborative relationships, including the development of networks of reform programs to encourage benchmarking of best practices and the development of supportive relationships among reformers; a systematic inventory, analysis, model development, and dissemination of model practices; and technical assistance.

In the final analysis, some mix of all three strategies is necessary to expedite and achieve scale in reform. Make'em strategies work best if resources are provided and technical assistance is available. Bribe'em strategies tend to result in ritual grantsmanship in the absence of performance standards and the know-how that comes with efforts to show'em how. Show'em how strategies, by themselves, do not provide the leverage that mandates and resources bring.

A Current Assessment

A current assessment of educational reform points up remarkable progress and continuing challenges. Most reform efforts have focused on meeting higher standards in academic curricula. These reforms have resulted in both progress and further promises of progress. At the same time the reform of traditional academic education has done little to eliminate tracking and dualism. The tendency is to set the bar even higher for general track and vocational students without resolving basic issues as to how those students are to meet higher standards. Moreover, the academic reform movement has only experimented at the margins with more experiential curricula developed by cognitive scientists. Reform tends to be a top-down exercise that limits the commitment and involvement of stakeholders.

School-to-work programs in secondary schools exhibit a similar pattern of successes and future challenges.[150] Traditional apprenticeship programs are available to about 300,000 people, but the average age of apprenticeship is 28--well beyond traditional schooling. The programs provide a strong technical curriculum, motivation that comes from belonging to a community of learners, and a structured work-based learning component. Vocational education provides an applied curriculum, increasingly organized in broad occupational clusters, to maximize mobility of students after graduation. Programs sponsored by the Southern Regional Education Board (SREB) have successfully integrated higher academic content into traditional vocational programs. Agricultural education (4-H) still reaches more than 4 million youngsters, although it is declining with mechanization of agricultural employment; it provides ownership, involvement, and a strong sense of community among students and an applied curriculum based on carefully designed student projects. Cooperative education reaches about a half million students and provides informal work experience in conjunction with schooling. Magnet schools provide high-quality education that mixes academic and experiential learning in particular career tracks from the performing arts to engineering. Career academies provide industry-based curricula that balance academic and experiential learning within schools for about 10,000 students. In Philadelphia, career academies have had some success in extending participation to college-bound students. Tech-prep programs provide technical education that both sets and meets high standards and provides access to technical education after high school. There are 120 tech prep programs in 33 states covering about 50,000 students. Youth apprenticeship programs provide work experience as part of the learning process.

Virtually all the elements of a successful system are evident to some degree in the mix of current programs. In combination, the school-to-work programs achieve significant scale. Equity considerations are still a concern, but the focus on skill clusters in vocational education, the technical quality of tech-prep, and the successes of magnet schools, and career academies are making these programs more attractive to all students. With the exception of the Philadelphia career academies, neither academic reforms nor school-to-work programs directly break through the dualism in American education. Tech-prep provides access to two-year postsecondary education, but all programs need to work on developing both curriculums and standards that do not preclude access to four-year postsecondary education either directly or by way of two-year schools.

All reform programs integrate academic and applied learning to a greater or lesser extent. The work of cognitive scientists attempting to integrate applications into traditional academic curricula is minimal and experimental. Vocational educators are hard at work integrating academic content into vocational programs, led by experimentation in programs sponsored by SREB. The 4-H programs integrate academic and applied learning with carefully structured projects. Career academies focus school curriculums on occupational competencies in particular industries. Cooperative education provides unstructured work experience. Traditional apprenticeship programs set the standard for combining academic learning with structured learning in workplaces. Youth apprenticeship programs provide a less structured version of traditional apprenticeship.

Certification and standards are a cutting-edge issue in every education reform. In the mainstream reform of academic education there are a variety of efforts to set academic standards and certification at state and national levels. The SREB programs represent the state of the art in standard setting in traditional vocational education. Standards and certification are deeply embedded in traditional apprenticeship. Among the new school-to-work programs, Tech Prep has gone furthest in setting standards and assessments. Standard setting and certification are fragmented and in various stages of development in other school-to-work programs.

Standards will remain at the heart of the reform movement. Skill standards are at the core of *Goals 2000*, the Clinton administration's reform program. *Goals 2000* proposes two standards boards, one to create and certify academic standards and another to establish and certify standards for workers in jobs that do not require baccalaureate degrees. The challenge for both boards will be to create an integrated set of standards that are accessible to all Americans and to provide continuity between education and workplace skill standards, creating continuous developmental pathways that combine learning in schools, communities, and workplaces.

Current reform efforts demonstrate different kinds of involvement among stakeholders including students, communities, and employers. Career academies and 4-H create a community of students to provide motivation and support. Traditional apprenticeship, cooperative learning programs, and youth apprenticeship provide experiences in the adult world of work.

Apprenticeship and cooperative education models use employers as teachers, provide authentic socialization in the world of work, and leverage real job opportunities. Access to workplaces is the ideal and most intensive form of employer involvement. Ultimately, the success of reforms will depend substantially on their ability to generate participation among employers. It is unlikely, however, that the vast majority of employers will be able to afford to open up workplaces as learning annexes for schools anytime soon.

In the short term, school-to-work and pedagogical reforms are likely to be developed fastest in education institutions themselves. Applied pedagogy can be developed without employer participation. Advances in the cognitive sciences demonstrate that experiential learning can be embedded in academic contexts even in the more conceptual curricula like history or English.

Most school-to-work curricula do not rely on apprenticeship slots in employer organizations. Although access to workplaces is ideal, authentic real-world experiences that reduce the isolation of schools and students, encouraging self-confidence through mentoring, can also be provided through community service.

Employer participation in setting and using standards for hiring, however, is critical, because if employers are unwilling to validate standards by using them for hiring, students will have less reason to meet standards in school. Employer involvement is most important for non-college-bound students. Currently, young people in secondary schools going on to postsecondary education have an incentive to meet standards because their school performance determines access to community colleges or four-year schools.

Happily, the restructuring of the American economy should continue to create added demand for postsecondary degrees, especially with the help of policies that encourage restructuring for the sake of competitiveness and demand for more high-skill, high-wage jobs. Students who are not going on to postsecondary institutions have less interest in meeting standards because school performance has little effect on hiring decisions or entry-level pay.[151]

Although, it is critical to push forward in the use of employer organizations as learning sites, in the immediate term the most effective improvements in the transition from school to work can be achieved by using employers as advisers and partners in building academic standards tied to work performance. This practice will encourage hiring based on school performance at all levels of schooling, but especially among non-college-bound students. A more collaborative relationship in selection and school performance will encourage both better school performance and more effective use of skills on the job.

Changes in pedagogy and involvement of stakeholders, especially employers, are at the core of the flexible lifelong system of work and learning that has become the common vision for both educators and employers. But these monumental changes will not occur without professional development to refocus education professionals and without better labor market information and more counseling for individuals moving through this complex system of work and learning. Professional development of educators, as in most professions, is looking inward at a time when changes outside the education system are forcing changes. The quality of labor market information is bare bones in American communities.

The National Occupational Information Coordinating Committee (NOICC) and its state counterparts provide a solid structure on which to build in developing high-quality labor market information for common use by schools and the Employment Services. But the information will be useless in the absence of a stronger system of career counseling, both in schools and in the Employment Services. Counseling in schools focuses on course selection guidance for college-bound students. Counselors spend less than 5 percent of their time doing job placement. Moreover, student loads for counselors range from 300 to more than 1,000 per counselor. Counseling outside schools, principally in the Employment Services, is virtually nonexistent and tends to focus on moving people into low-wage jobs and off unemployment insurance rolls.

Conclusion

Convergence

The interests of America's business and educational institutions are beginning to converge. In fact, the workforce we need in the emerging global economy has made the educators' cultural, political, and economic missions more consistent. Schools teach and develop the whole person. These days the best of our economic institutions are learning to use the whole person on the job as well. This has not always been the case.

In the old mass-production economy, employees, especially nonsupervisory employees, held narrow jobs with little autonomy. In mass-production systems, the notions of participation or individualism were anathema to rigid job designs and carefully orchestrated production systems. The economy had little use for the whole person on the job. Instead, the mass-production system used narrowly defined skills that represented only a small portion of an employee's capacity and educational preparation. The mass-production economy used narrow skills in conjunction with narrow-purpose technologies to produce standardized components of products or services that were eventually orchestrated into final products or services by rigid, authority-based, top-down institutional hierarchies.

The old economy dumbed down work by automating in order to produce ever higher volumes of standardized goods and services at least cost. In the emerging new economy, the need to meet new quality standards and to exploit new technologies requires more skilled employees, especially among non-college-bound workers who make the products, deliver the services, and interact with customers. In the new economy, jobs use the whole person. Flexible persons autonomy, education, and skill are required to work with flexible technologies in the context of equally flexible work processes and organizational structures.

From Access to Outcomes

Educational and business institutions face many of the same challenges as they confront the demands of the new economic competition. To some extent, both business and educational institutions are victims of their own past successes, as they struggle to respond to new economic demands. The principal achievement of American business since the mid-19th century has been its ability to mass produce goods and services ever more cheaply, thereby making them available to a growing share of Americans. Similarly, educators have increased access to education enormously from preschool to graduate school while maintaining basic standards. Of course, many people still have limited access to basic goods and services provided in private markets, and access preschool and postsecondary education is still unavailable to many Americans. But in the new economy, the ability to provide access to goods and services in businesses or schools is not good enough.

Modern consumers are no longer satisfied with access to private products and services or public education that is simply cheap and generally available. Modern consumers want quality. They want a variety of state-of-the-art goods and services, customized to their needs, delivered conveniently, quickly and consistently to a high standard. Students and parents similarly demand quality education. In general, quality education is education that meets a variety of preferences and needs, customized to individual learning styles, and delivered conveniently, quickly, and consistently to a high standard.

The shift from standards emphasizing price and availability to standards that emphasize quality represents a shift in emphasis in organizational performance standards from access to outcomes in both business and educational institutions. Strategies for encouraging access tend to focus on the production of goods or services at least cost, while quality standards focus on the outcome of the product or service after it is produced. Similarly, strategies for increasing access to goods or services tend to be driven by the provider's perspective, whereas quality standards are customer-driven.

The Bottom Line

The reforms described here will not be easy. Some of the changes in procedure will not be expensive, but they will require changes in long-time habits and the removal of entrenched bureaucracies.

Some of the reforms, however, will require more cash. New technology is expensive. Most American teachers do not have access to a private workspace, a phone, or a fax, let alone state-of-the-art computers and software. It will be expensive to retrain teachers and give them the support they need to stay up to date. Providing a variety of educational experiences and customized instruction will require more teachers and more support staff. The general articulation of the teaching function into a new teaching workforce that includes master teachers, parateachers, and technicians will add personnel costs.

Overall, education is a skill-intensive art that depends on a meaningful interaction between a student and a teacher. Providing more and better instructional personnel, each teaching to a smaller number of students, is expensive. Currently, the ratio is about 24 pupils to each teacher. But most experts agree that pupil-teacher ratios need to decline to about 15 to 1 before there are measurable academic effects.[152]

Most educators have been through rounds of reform before. Sputnik and desegregation resulted in wide-ranging critiques of schools and major challenges. This time, instead of challenging schools to prepare students who can match the Soviet military and science challenge, we are trying to beat technical competition from Japan and Europe in the civilian economy. The demands for change for economic progress are occurring at the same time that demands are growing for schools to respond better to their multicultural student populations.

Business and educational institutions face the same economic challenge and the same barriers as they struggle to shift from access standards and the mass-production systems they encourage to the more flexible structures necessary to promote global quality standards. Historical success in

providing access is perhaps the greatest barrier to the new orientation. Old and once successful habits die hard. American employers and schools are world class in the art of mass production and rightfully proud of the access to goods and services they have provided. Unlike our global competitors who got a fresh start after World War II, we labor onward into the new quality environment dragging along the dead weight of our past successes.

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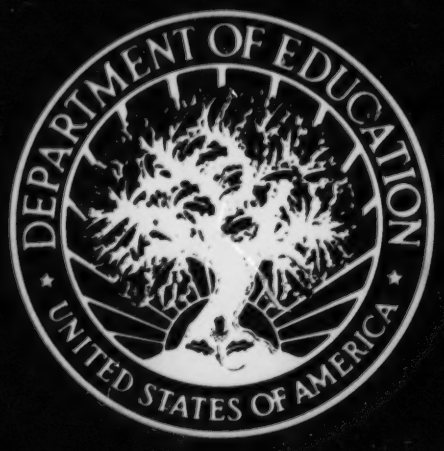

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